ICD

CQ

March 1966
75¢

In Next Month's CQ . . .

The EYE-BANK NETWORK

PUBLIC SERVICE AT ITS BEST

Typhoon Strikes DXpedition K7LMU, ZL2AWJ lost at sea

SEE PAGE 7

The Radio Amateur's Journal

Soixante-Treize, Mon Cher Ami!

73, Old Man. You've worked another good one. With the clean voice signal of Collins 32S-3 transmitter. It gives you a lot to work with. Nominal output of 100 watts—175 watts PEP input on SSB and 160 input on CW. Gives you superior stability, transceive operation, mechanical filter sideband generation. And there's automatic load control, permeability-tuned VFO and crystal-controlled HF oscillator. With Collins 32S-3 there's no telling where you'll work your next QSO. See your authorized Collins distributor today.

Be sure to see the S/Line at the SSB show during New York IEEE.

COLLINS

For further information check number 50 on page 110

Get better performance...lower your SWR

Cesco

STANDING WAVE REFLECTOMETERS

Model CM-52
Combination phase and control unit

$29.95 list

Remote Control Unit for CM-52-2

$34.95 list

Model CM-52-2
Separate phase unit

Outstanding sensitivity...perfectly balanced

Cesco high quality reflectometers give precise SWR and relative power readings immediately . . . without plotting power readings on a chart.

They employ mutual inductance and capacity coupling between linear conductors for continuous measurement of standing waves on transmission lines. Suitable for frequency range from 3 to 200 megacycles and continuous line insertion at powers from 25 to 1000 watts, they give excellent performance on power input of 10 watts — 7 mc's and up. (Only 5 watts output are needed for 100 mc's and up.) Line insertion loss is less than one DB at 30 mc's.

Exceptional Features

- Sensitive 0-100 microamp meter calibrated directly in standing wave ratio.
- Ideal for continuous line insertion.
- Power to 1000 watts and over.
- Prevent false loading from antenna tuner, match box, PI network, etc.
- SWR observed immediately without interpolation.
- Increase radiated power by line reflection reduction.
- Simplify antenna match adjustments.
- Power output comparison meter.
- No balancing adjustments — no reversing.
- Accurately hand calibrated and balanced.
- Frequency tested from 3 to 200 mc's.

"THE HOME OF ORIGINALS"

5950-A

Cesco DIVISION **NEW-TRONICS CORP.**

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For further information, check number 1, on page 110

Hallicrafters advanced technology brings you a new breed of amateur equipment

SX-146 Receiver

This is an amateur band receiver of advanced design employing a single conversion signal path and pre-mixed oscillator chain to assure high order frequency stability and freedom from adjacent channel cross-modulation products. The SX-146 employs a high frequency quartz crystal filter and has provision for installation of two more crystal filters. The receiver may also be used from 2 to 30 mc, with the exception of a narrow gap at 9.0 mc, with the connection of auxiliary oscillators. The highly stable conversion oscillator chain may be used for transceiver operation of the matching HT-46 transmitter.

FREQUENCY BANDS: 3.5-4.0; 7.0-7.5; 14.0-14.5; 21.0-21.5; 28.0-28.5; 28.5-29.0; 29.0-29.5; 29.5-30.0 mc (28.0 to 28.5, 29.0 to 30.0 requires extra crystals at users option).

SENSITIVITY: Better than 1 μv for 20 db S/N.

TUBES AND FUNCTIONS: 6JD6 RF amplifier; 12AT7 Signal mixer and cathode follower; 6AU6A 9 mc IF amplifier; 12AT7 AM detector—AVC rectifier—product detector; 12AT7 USB—LSB crystal oscillators; 6GW8 Audio amplifier and audio output; 6BA6 Variable frequency oscillator; 6EA8 Crystal heterodyne oscillator and pre-mixer; Plus diode power supply rectifier, ANL diode and AVC gates diode; *6AU6A—100 kc crystal calibrator oscillator; *Harmonic generator diode.

PHYSICAL DATA: Size: 5⅞" x 13⅛" x 11". Shipping wt., 20 lbs.

FRONT PANEL CONTROLS: Frequency: Power off CW-upper-lower and AM; Audio gain; Band selector—3.5, 7.0, 14, 21.0, 28.0, 28.5, 29.0, 29.5; Selectivity—0.5, 2.1, 5.0 kc (0.5 and 5.0 kc filters optional extra); Pre-selector; RF gain; AVC on-off; Cal. on-off; ANL on-off; Phone set jack; Smiter.

REAR CHASSIS: S-meter zero adjust; Internal-External oscillator switch; Slave oscillator output; External oscillator input; Antenna socket; Speaker, ground and mute terminals; Grounding stud; AC power cord.

POWER REQ.: 105/125 volt—50/60 cycle AC—55 watts.

I-F SELECTIVITY: Uses a 6-pole crystal filter to obtain a nose-to-skirt ratio better than 1 to 1.8.

Amateur net, $269.95

Model HA-19 plug-in, 100-kc quartz calibrator available as accessory. **Amateur net, $19.95**

**Part of HA-19 calibrator.*

HT-46 5-band transmitter

All new from the ground up! Here's the "new breed" transmitter that matches your SX-146 . . . works independently or may be interconnected for transceiver operation.

FEATURES: 180 watts PEP input on SSB; 140 watts on CW; Frequency control independent or slaved to SX-146 receiver; Upper or lower sideband via 9 mc quartz filter; Built-in power supply; Press-to-talk or optional plug-in VOX; grid block for keying for CW.

FREQUENCY COVERAGE: 3.5-4.0, 7.0-7.5, 14.0-14.5, 21.0-21.5 mc and 28-30 mc in four 500-kc steps. Crystal supplied for 28.5-29.0 mc coverage. Other plug-in crystals at user's option.

TUBES: 6BA6 VFO; 6EA8 Heterodyne crystal oscillator and mixer; 12AT7 Carrier oscillator-third audio; 12AT7 Mic amplifier; 6EA8 9 mc I-F amplifier and AALC; 6AH6 Mixer; 12BY7 Driver; 6HF5 Power amplifier; 0A2 Reg.

FRONT PANEL CONTROLS: Frequency Tuning; Operation-Off, Standby, USB, LSB, CW-Tune, Standby LSB USB; Microphone gain; Driver tune; Carrier level; Band selector; Final tune; VFO selector—Transmitter-Receiver; Dial cal.; Calibrate Off-On; Meter MA-RFO.

REAR APRON FUNCTIONS: AC Cord; Ground lug; Fuse; Key jack; VOX accessory socket; Antenna jack; Receiver input (for transceiver); 11 pin control socket; bias adjust.

PHYSICAL DATA: Size: 5⅞" x 13⅛" x 11". Shipping wt., 26½ lbs.

HA-16 Vox Adapter, **$37.95** **Amateur net, $349.95**

R-51 Speaker,

4 x 6 inch oval speaker and attractive 24 hour clock.

amateur net $34.95

"Quality through Craftsmanship"

hallicrafters

Fifth and Kostner Aves., Chicago, Illinois 60624
Export: International Division

Available in Canada from Gould Sales Co.

For further information, check number 2, on page 110

CQ

MARCH 1966 VOL. 22, No. 3

The Radio Amateur's Journal

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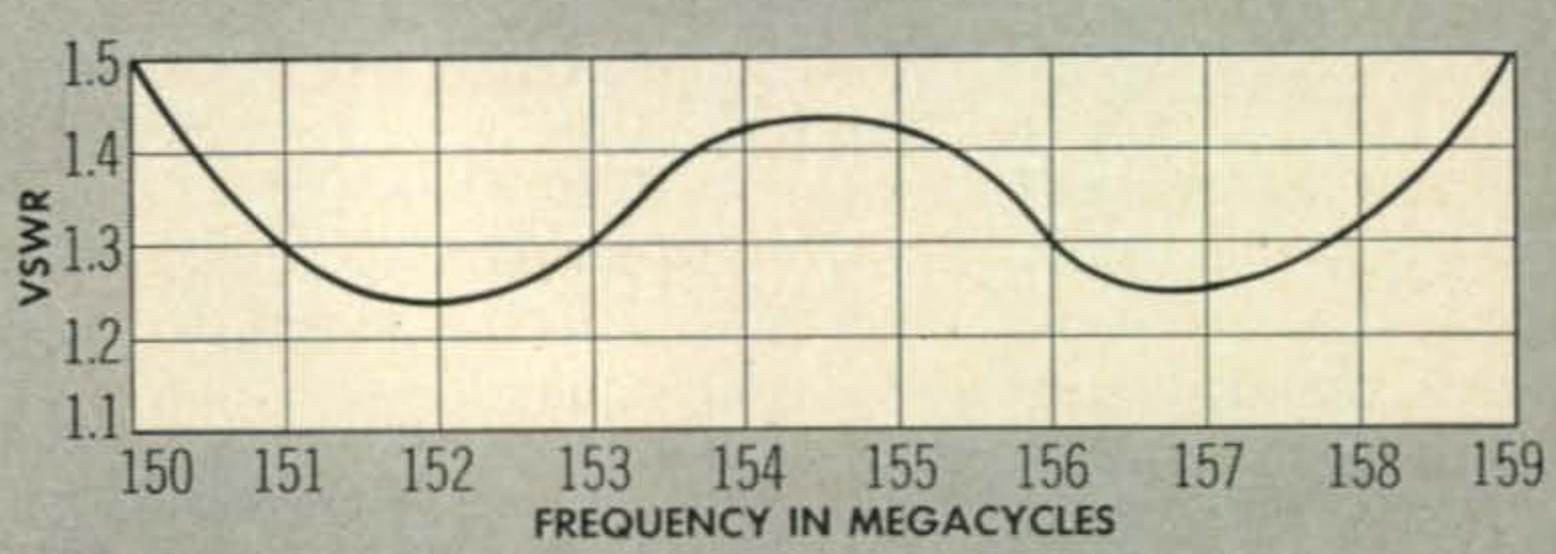
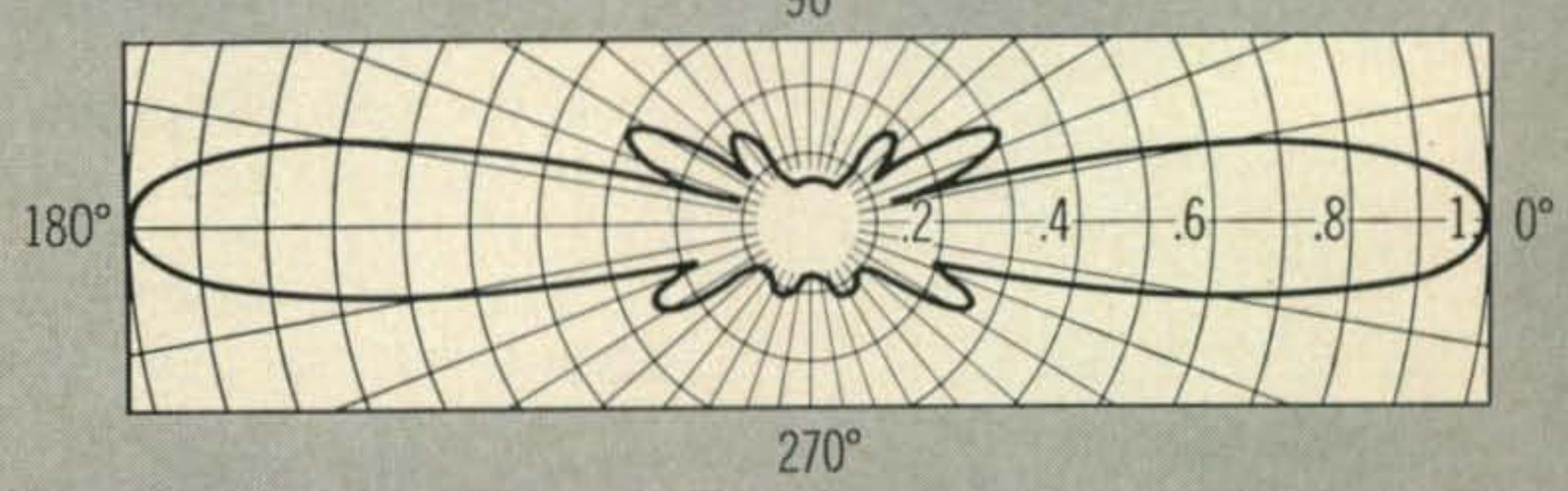
It's Here! The New CPC BROADBAND...

SUPER STATIONMASTER®

Base Station Antenna



9.0 Mc Bandwidth!



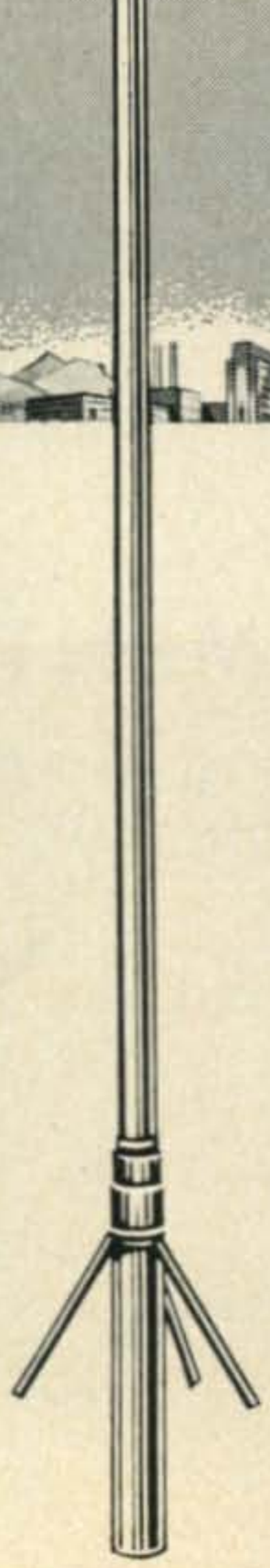
This new CPC antenna has all the qualities of its predecessor, plus new features not now available in any antenna made for the land mobile services

CAT. No. 220-509
SUPER STATIONMASTER

is a second generation antenna growing out of 30,000 STATION-MASTERS and ten years of experience with this type array.

Because of its exceptional bandwidth, the SUPER STATION-MASTER is produced in three ranges which cover the VHF band, 150 to 159 Mc, 157 to 166 Mc, 165 to 174 Mc.

A 10 db—10 Mc wide version, CAT. No. 455-509, is available to cover 450 to 470 Mc in two ranges.



Electrical Specifications

Nominal input impedance	50 ohms
VSWR	1.5:1
Bandwidth	9.0 MC
Maximum power input	500 Watts
Flexible terminal extension	18" of RG 8A/U
Terminations	Type UHF female and Type N male
Vertical beam width (½ power points)	18°
Lightning protection	Direct ground

Mechanical Specifications

Radiating elements	Copper
Element housing material	Fiberglass
Element housing length	20'
Support pipe	2¾" dia. 6061-T6 aluminum pipe
Rated wind velocity	100 MPH
Lateral thrust at rated wind	79 lbs.
Bending moment 1" below ground plane at rated wind	521 ft. lbs.
Weight	30 lbs.

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CORPORATION

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For further information, check number 4, on page 110

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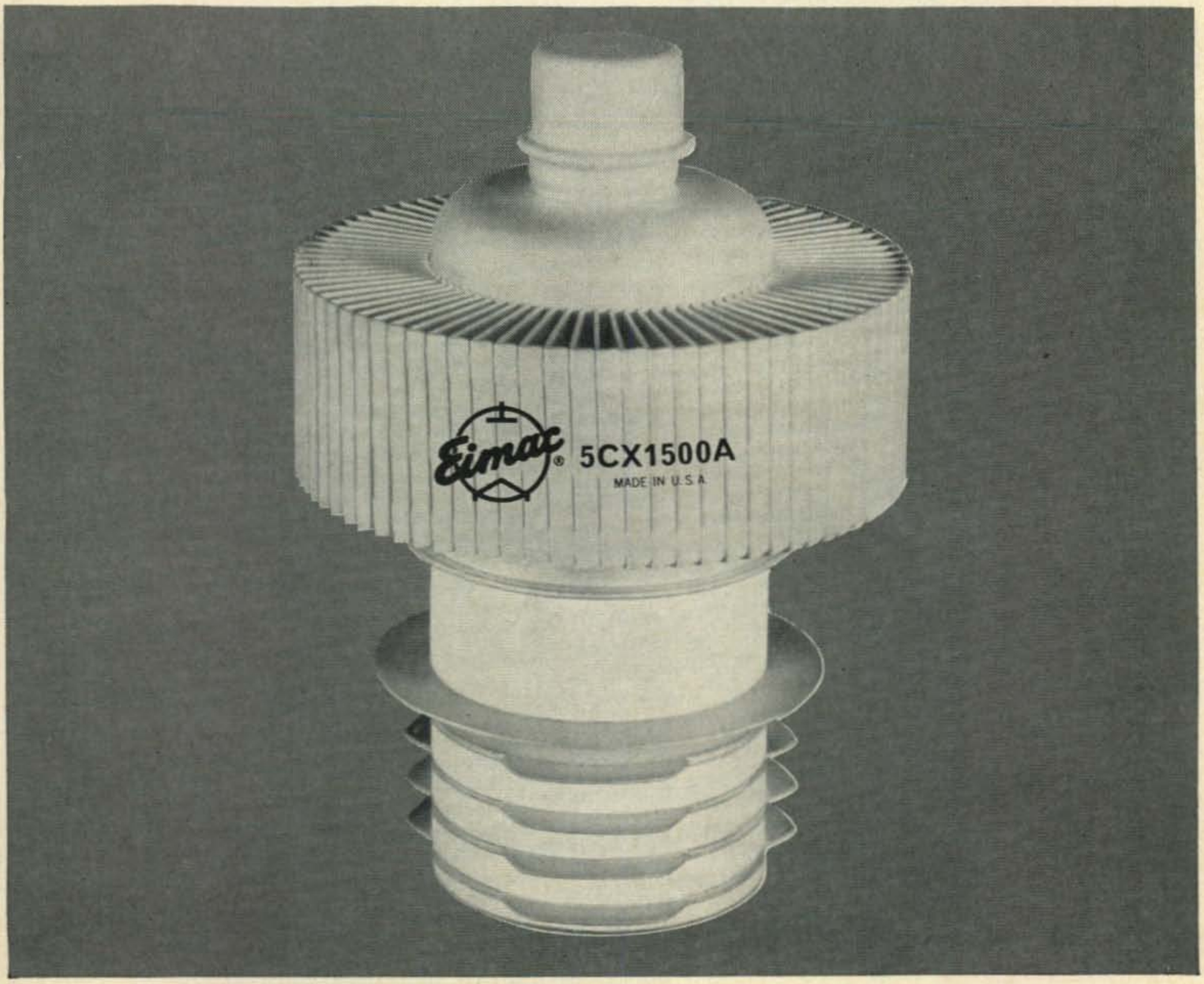
new power amplifier pentode provides excellent linearity

Now you can have reliable power in a new 1500 watt pentode. Eimac's 5CX1500A power amplifier tube is designed for use at the popular 1000-2000 watt peak envelope power range. And it's compact: height, 4⅞", diameter 3½". Physical configuration is similar to Eimac's well-known 4CX1000A tetrode. The tube carries control and screen grid dissipation ratings of 25 and 75 watts, respectively. The 5CX1500A is ideally suited for Class C operation. In linear service the tube can provide a two-tone signal with third-order products of —39 db at 1000 watts PEP or —35 db at 1700 watts PEP. Write Power Grid Product Manager for information or contact your local EIMAC distributor.

5CX1500A	
CLASS C MAXIMUM RATINGS	
DC PLATE VOLTAGE	5000 V
DC PLATE CURRENT	1.0 Amp.
DC SCREEN VOLTAGE	750 V
PLATE DISSIPATION	1500 W
SCREEN DISSIPATION	75 W
GRID DISSIPATION	25 W
SUPPRESSOR DISSIPATION	25 W
TYPICAL CLASS AB, LINEAR AMPLIFIER MEASURED VALUES IN TWO TONE TEST	
DC PLATE VOLTAGE	4000 V
DC PLATE CURRENT (No Signal)	250 mA
DC PLATE CURRENT (Two Tone)	485 mA
DC SCREEN VOLTAGE	500 V
PEAK ENVELOPE POWER OUT	1785 W
THIRD ORDER IM MAXIMUM	—35 db

EIMAC
Division of Varian
San Carlos, California 94070

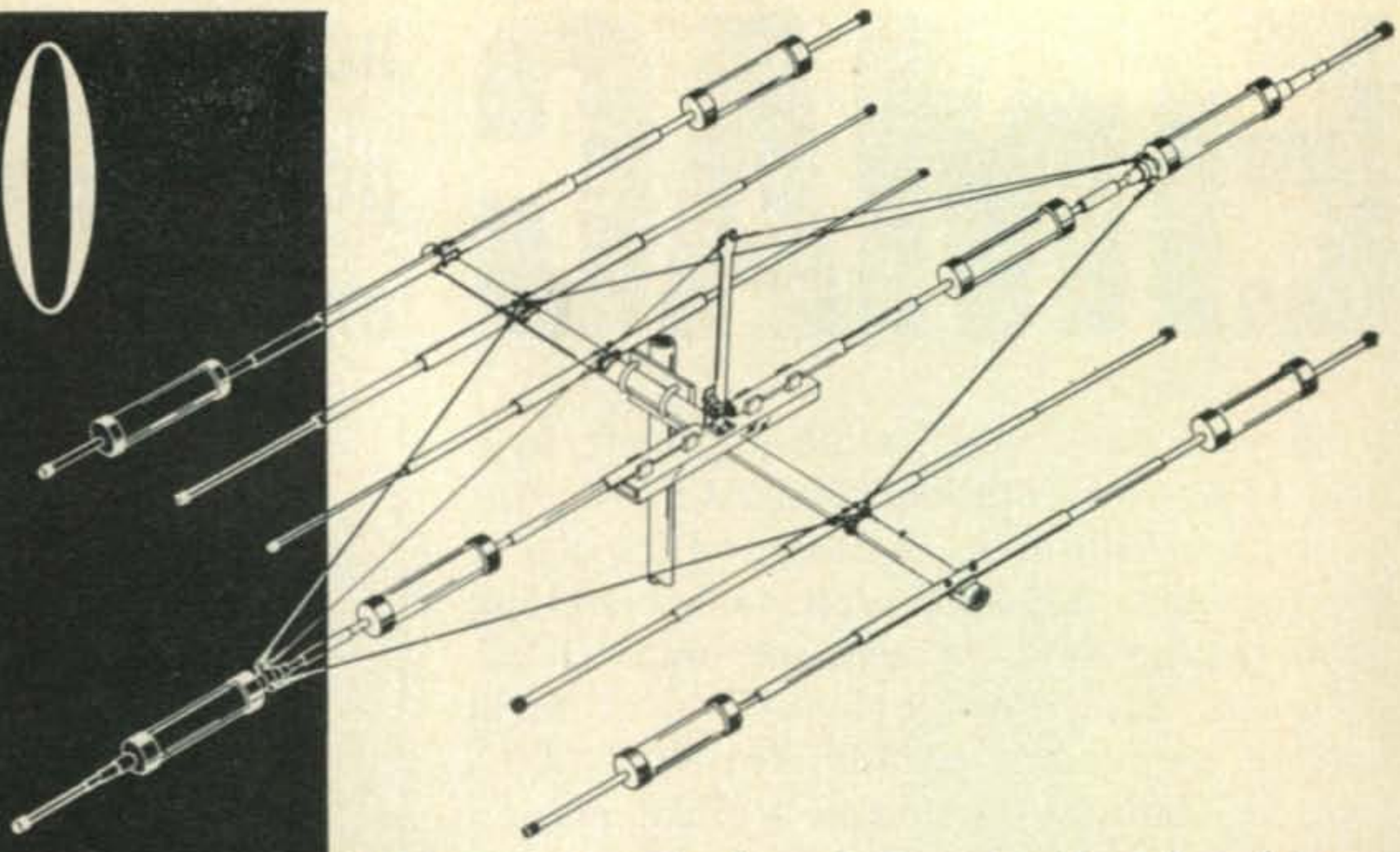


See EIMAC Amateur Radio Display at 1966 IEEE New York Varian Center

For further information, check number 5, on page 110

TA-3640

for 10 15 20 and 40 meters



Mosley Electronics, Inc.

4610 NORTH LINDBERGH BLVD.
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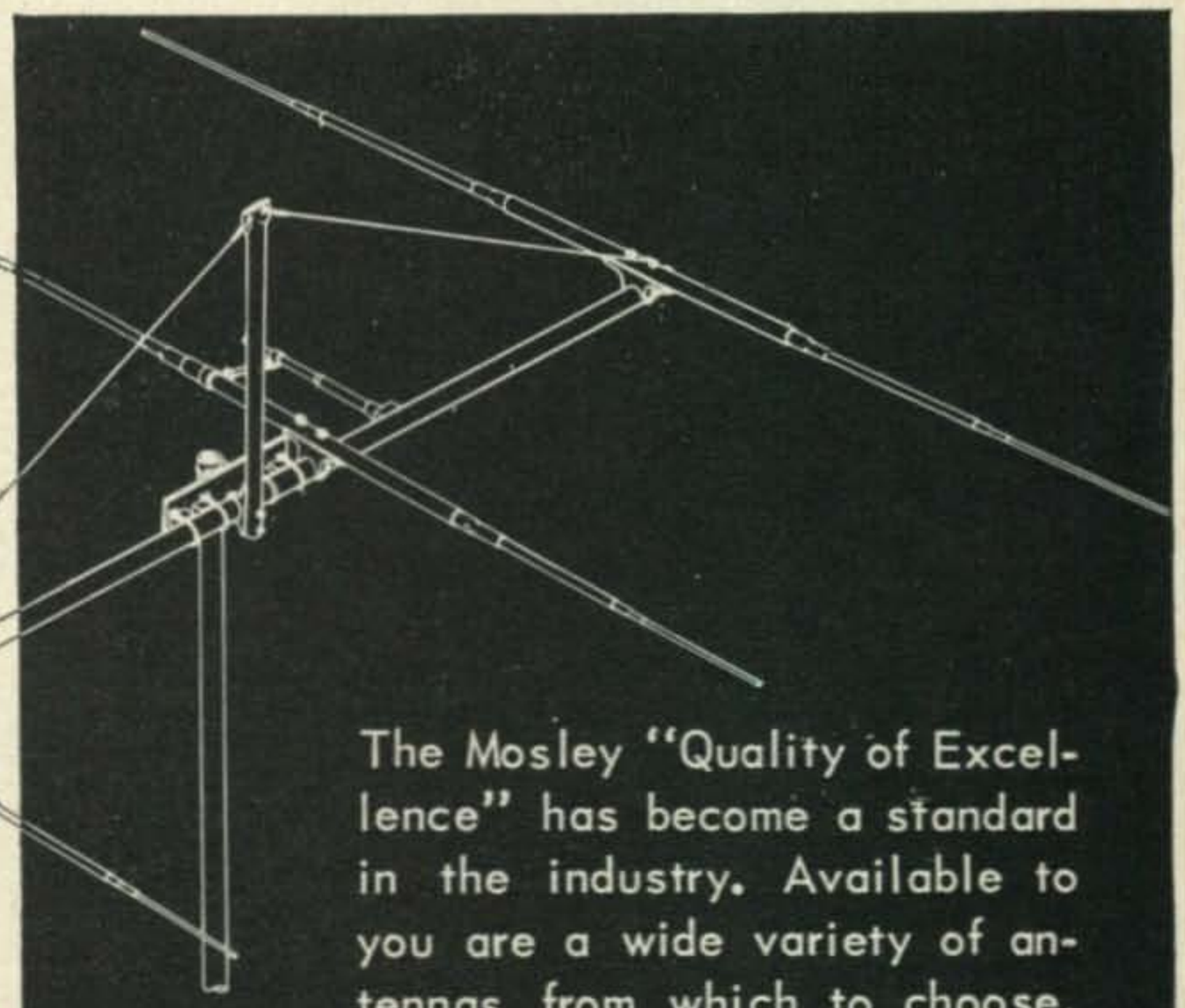
Put your signal where it counts. Use the ultimate in Ham beams - - - the Mosley TA-36 with Kit TA-40KR added to radiating element. Employs 4 operating elements on 10 meters, 3 operating elements on 15 meters, 3 operating elements on 20 meters. SWR is 1.5/1 or better at resonant frequencies over all 4 bands. Constructed of heavy-wall aluminum for maximum strength. Rated for full power.

Write for detailed specifications and performance data on the Mosley TA-3640.

For further information, check number 6, on page 110

A-203-C

for 20 meters



Concentrate on 20 meters - - - the best DX band today. Use a Mosley full-size A-203-C wide spaced, gamma matched, 20 meter beam. Features: VSWR 1.5/1 or better. Rated for full power. Assembled weight 40 lbs. Turning radius 22 feet.

Exclusive Mosley element design virtually eliminates element flutter and boom vibration.

The Mosley "Quality of Excellence" has become a standard in the industry. Available to you are a wide variety of antennas from which to choose, plus antennas custom made to order. Let Mosley know your antenna needs.

Mosley Electronics, Inc.

4610 N. LINDBERGH BLVD., BRIDGETON, MO. 63044

For further information, check number 7, on page 110

ZERO BIAS

CQ FOR January and February played heavily upon our personal dissatisfaction with DXpeditions and some DXpeditioners. This month, too, we must return to the subject, but with tragic overtones to the story.

At about 2:00 P.M. on January 27, Chuck Swain, K7LMU, Jim "Ted" Thorpe, ZL2AWJ, and a crew of three, on board a 38′ ketch set sail from Wallis Island heading due East for Apia. The trip was to take three to four days. A vicious typhoon struck the area January 29-30. No trace has been found of the ketch *Marrinero* or its crew as this is being written on February 11.

Ted was to leave the DXpedition at Apia and return to New Zealand, while the *Marrinero* was to continue on to Pago Pago where Don Miller, W9WNV was to rejoin the crew after a ten day stateside visit. Don is now in the area aiding in the air search as a spotter, as is George, 5W1AZ. While the situation shouldn't be considered hopeless, it is extremely grave.

While we may not agree with the practice of DXpeditions, and have voiced our dissatisfaction with this particular expedition, we join the amateur world in silent prayer that the boys have somehow found safety. We pray, too, that that measure of sanity for which we pleaded in January will now finally settle upon the DX world.

CQ's Survey

In January *CQ*, as most of you are aware, we ran a Reader Survey questionnaire that was designed to sample trends in equipment, operating habits and *CQ* reader preferences.

A survey return of about ½% was anticipated based on previous experience with polls, and the fact that the reader had to cut the survey questionnaire from his issue of *CQ*.

Surprise! We now have in the house over a 1% sampling of our readers, with new replies drifting in at a rate of about 20 each day. Although we haven't yet had time to compile all the statistics that we eventually will, several interesting and startling trends have emerged.

Interesting is the fact that by far, most amateurs are still adhering to the traditional separate receiver—separate transmitter configuration in their stations, despite the the strong trend to single unit transceiver packages. Manufacturers take note. Interesting, too, is an extremely strong interest in home-brew projects—more interest than in all our previous surveys!

We were encouraged to learn that nearly every reader sampled was either just as active, or *more* active than he was five years ago! When you consider the fierce in-fighting that has been going on the past few years, (incentive licensing, Wayne Green's needling, Clif Evans' "exposé's", etc.), this is really a remarkable situation. How many thoughtful amateurs were seriously concerned about a potential decline of active operation directly resulting from the "side-taking," and scrapping? I *was* one of them; my mind's been changed.

However, the one frightening fact that emerges from the survey is that the number of newcomers being attracted to the hobby has dwindled to a post—W.W. II low. The rate of attrition through disinterest and death is just barely equalled by the tiny influx of beginners. This precarious balance could easily tip the wrong way with the result being that amateur radio in America would no longer even enjoy status quo. Could a shrinking service justify the interest of the dozens of manufacturers or justify even the limited h.f. spectrum space we now have? Good question.

But aside from our interests, the lack of newcomers threatens one extremely valuable proven characteristic of amateur radio: It's ability to provide that fabled "pool of communications experts." The current hostilities in Viet Nam have begun to drain a significant number of qualified technicians and communications experts from industry, particularly in the New England and Southern California areas. While the manpower situation is nowhere near critical, it does make you wonder what will happen should it become so. Will amateur radio be able to fulfill its traditional role of "the training ground of communications men"? No! Not with our present rate of growth!

What can be done? In the first place, what's needed for amateur radio more than anything else is a public relations campaign. Amateur radio must be placed before the public constantly, emphasizing public service, emergency communications, the magic of meeting new friends over the airwaves. We need coverage in national consumer magazines, newspapers, TV, radio, etc. It's a job that will cost some money and much hard work; but—it's a job that must be done.

We at *CQ* have tried to do our share, but

[*Continued on page 14*]

Our Cover

THE Eye-Bank Network has received a great deal of consumer-level publicity, but has yet to be given its deserved coverage in the amateur press. Next month we will feature a timely story of amateur radio's role in the Eye-Bank program, which locates and supplies human eyes for corneal transplants.

Designed for

M

Application

NO-STRING DIAL

No strings: no pulleys: no back lash: no flimsy assembly. The No. 10037 is a sturdy mechanically engineered "Designed for Application" dial assembly which completely eliminates the annoyances of string-driven pointers, eliminates all indicator stutter or wobble and provides positive pointer travel and resetability. The pointer is driven positively by a flexible but non-elastic molded gear driven rack which cannot slip, break or fall off a pulley. The geared flexible rack rides in a multi-slot extruded aluminum channel. This girder-like extruded piece provides mechanical rigidity to the assembly. Furnished complete with panel trim bezel and flexible coupling for output shaft.

JAMES MILLEN MFG. CO., INC.

MAIN OFFICE AND FACTORY

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MASSACHUSETTS

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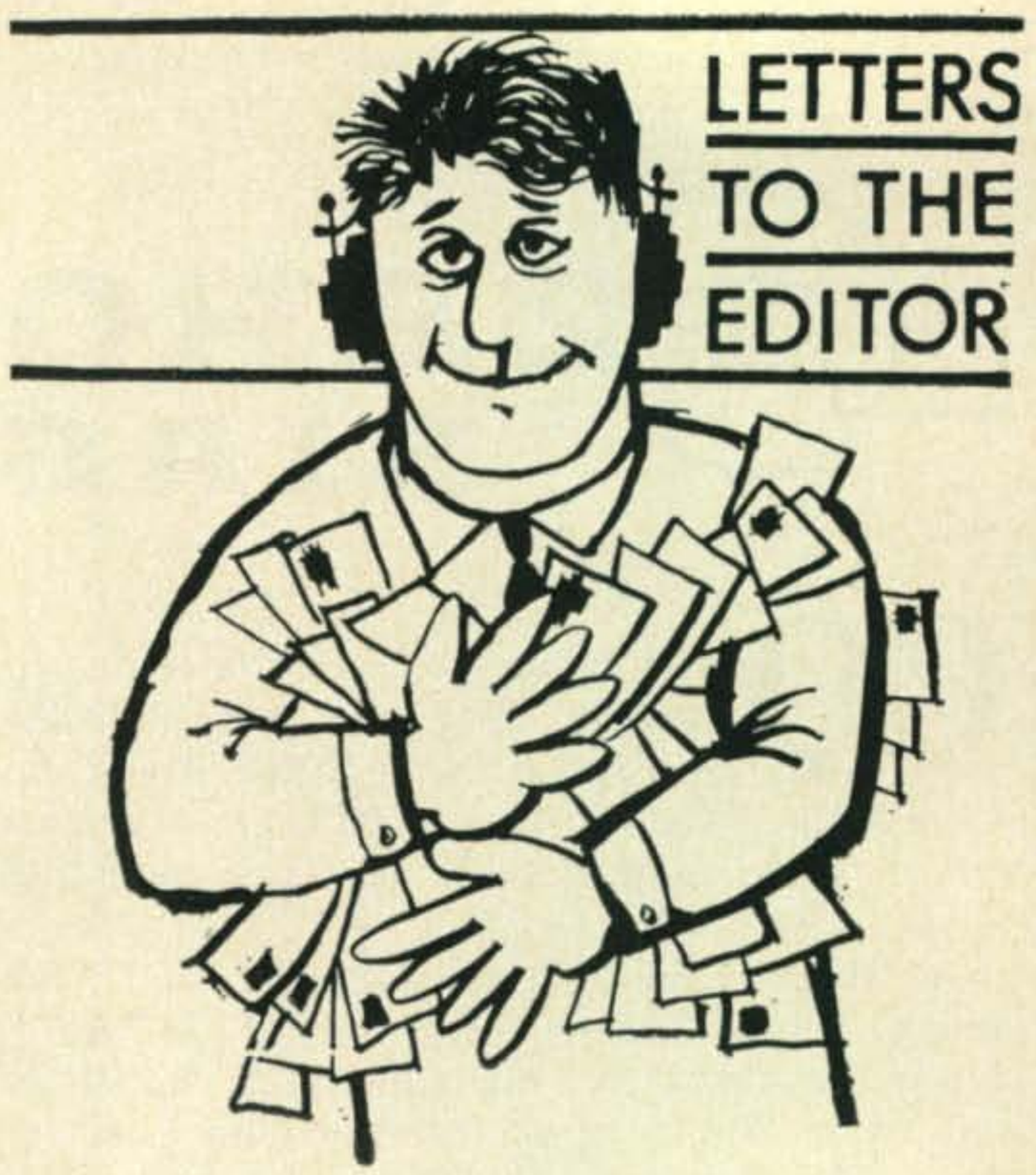


January Zero Bias

Dear Dick,

Your editorial ZERO BIAS in January 1966 issue is just great. It's just exactly my point of view, you just took the words from my mouth (or my heart).

As you know, I love contest operation because every contest gives the same opportunity to all hams, but in the case of DXCC, what do you think that a new ham feels? How he will get those 300 "new countries."

Revolting is just the word for it. I worked W9WNV in the first of the "new countries" he visited, I sent the QSL with 10 IRC's and my QSL was sent back to me with a rubber seal saying that either the date or the GMT time was wrong and to send another QSL with the correct time and date (and probably they wanted more IRC's). They will not even try to look in the day after or the day before at the same GMT time since I think the date may have been wrong (the QSO was 5/9 both ways). So I got so mad that I have not even bothered to hear the whereabouts of that gentleman.

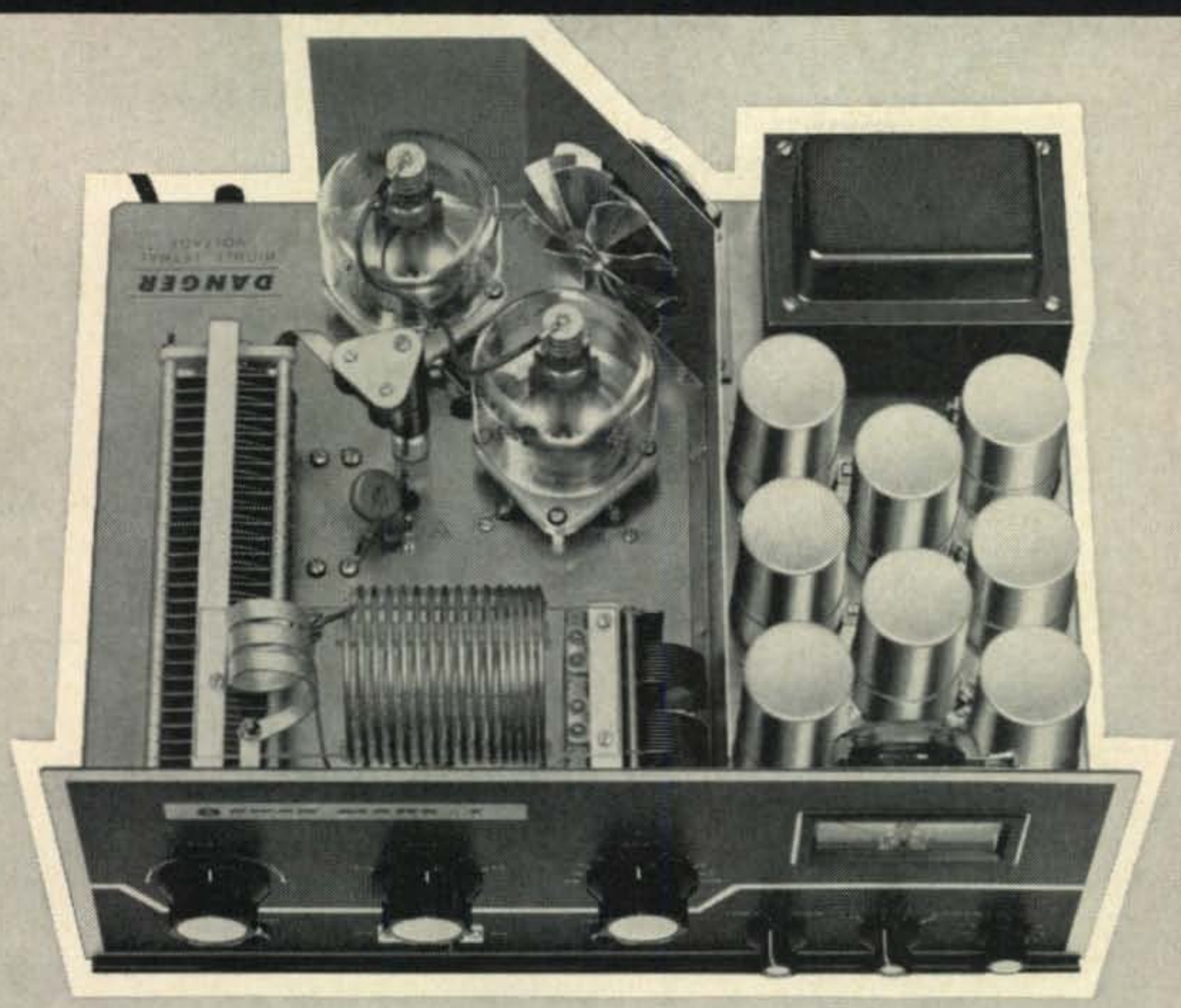
Congratulations on having the courage of touching that point.

In June this year, I made a little DXpedition (if you can call it so) to the Island of Margarita—300 miles driving plus 8 hours ferry trip. The island is only 50 miles off shore, to activate the prefix YV7, my call was YV5BIG/7. 1200 QSO's were made in 5 days (s.s.b.) using a KWM-2A-30L1 and a Mosley Vertical V-4-8. All expenses were paid by myself, QSL's were handled through my QSL Manager, K3SLP. Special QSL's were printed and sent to *all* stations by airmail whether or not a QSL was received. So each ham that contacted me had my QSL regardless if he QSL'ed or not—all at my own expense. The reasons were not to obtain glory or fame for me, but to activate a completely inactive prefix in my country. We also have a YV9 Certificate which is much wanted by our South American neighbors and all you need is to work 9 of our 10 prefixes. This was also my vacation, so I took my wife and kids along and operated only afternoons and nights until 12 P.M. It was fun. Of course, self addressed envelopes make the work easier for K3SLP, but we didn't want any money. I will never take a vacation paid by my fellow hams, hi hi.

Something will have to be done about this or DXCC will be a pain in the neck instead of a means of trying to work and make friends with more hams in more countries.

A Closing Idea: *CQ should sponsor a new trophy* and maybe certificate for each country or continent winner for the highest number of countries worked each year (like the LIDXA) but using the conditions stated by you in your article, *i.e.*, valid only if operation is

For further information check number 8 on page 110



It's what's *inside* that counts!

IF YOU'RE IN THE MARKET FOR THE LEGAL LIMIT IN POWER . . .
BE SURE TO SEE AND COMPARE THE

SWAN MARK I

2000 WATT P. E. P.
GROUNDED GRID LINEAR AMPLIFIER

Again Swan leads the field with maximum quality and dollar value

CHECK THE FOLLOWING

* Computer grade electrolytics provide 40 mfd. filter capacity for exceptional dynamic regulation.
* Ceramic insulation on all tuning capacitors, RF switches and relays.
* Built-in solid state 2500 volt power supply for 117 or 230 volts, 50-60 cycle AC.
* Covers amateur bands 10 through 80 meters.
* Two Eimac 3-400Z zero bias triodes in grounded grid circuit.
* 2000 watts P.E.P. input, 1000 watts CW and tune input.
* Drive requirements 100 watts.
* Wide range pi output.
* Includes changeover relay.
* Approx. weight 55 lbs.
* Dimensions: 19" x 8½" x 15½".

WITH ALL THE USUAL SWAN RELIABILITY AND PERFORMANCE.

$425 less tubes.
Tubes $68, pair.

SEE IT AT YOUR SWAN DEALER

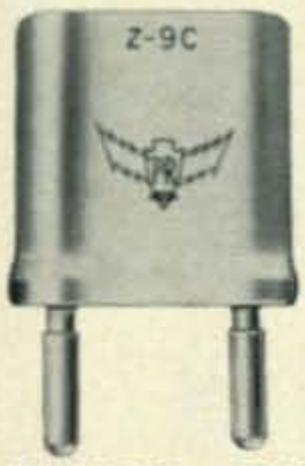
SWAN ELECTRONICS
Oceanside, California

For further information, check number 9, on page 110

Preferred for VHF since 1934

For more than 30 years, VHF experts have been enthusiastic about the outstanding performance of PR Crystals . . . their activity, dependability, low drift, and hair-line accuracy. These qualities are built-in by precision workmanship at every stage of manufacture. And EVERY PR CRYSTAL IS UNCONDITIONALLY GUARANTEED.

FUNDAMENTAL, PR TYPE Z-9C



Frequency Ranges in Kcs.: 1,750 to 2,000 (160M); 3,500 to 4,000 (80M); 7,000 to 7,425 (40M); 8,000 to 8,222 (2M); 8,334 to 9,000 (6M) ± 500 Cycles. $2.95 Net.

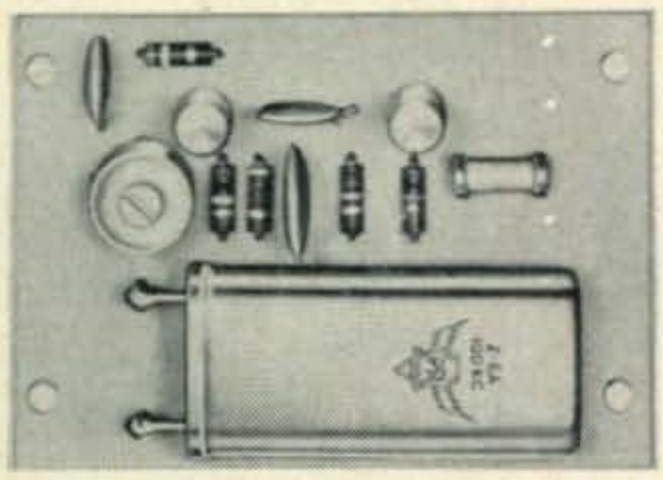
(All Z-9C Crystals calibrated with a load capacity of 32 mmfd.)

THIRD OVERTONE, PR TYPE Z-9A

Third Overtone, PR Type Z-9A, 24,000 to 24,666, 25,000 to 27,000 Kc. ± 3 Kc., 28,000 to 29,700 Kc. ± 5 Kc. . . . . $3.95 Net

6 Meters, Fifth Overtone, PR Type Z-9A, 50 to 54 Mc., ± 15 Kc. $4.95 Net.

Radio Control, PR Type Z-9R
Calibrated .005% . . . . $2.95 Net
Calibrated .002% . . . . $3.95 Net



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EXPORT SALES: Roburn Agencies, Inc., 431 Greenwich St., New York 13, New York

For further information, check number 10, on page 110

verified by a native ham or an amateur visiting . . .

I offer the 1966 winner the first trophy, not in my own name, but in the name of the Radio Club Venezulano.

Raul Eiris V, YV5BIG
E. Edison A-19
A. Cumana, Las Palmas
Caracas DF, Venezuela

Poor Returns

Editor, *CQ:*

The eyes of the world are on the U.S.A. some hoping for financial assistance, some for defense, some with hatred, some simply for love of the people.

My eyes are on the U.S.A. hoping for those many QSL's that never seem to come. Of over 1000 cards sent, I have only received 400, a poor show for the richest country in the world.

Gordon Brown, "Don", VE6FF
38a Kennedy Rd. 4th Floor
Hong Kong, China

Thoughts From A Colorful Fellow

Editor, *CQ:*

I, for one, have certainly enjoyed *CQ* for a good number of years and I still think it is interesting, but I will say that you have been 'going in' for too much of certain things.

I have decided that I must be allergic to some colors. Some time ago I stopped buying *CQ* because of too much GREEN and now I am forced to discontinue it because of too much SILVER.

Let's get down to BRASS facts and I think you will realize more COPPER.

Thanks anyhow for many hours of past pleasure.

Gilbert F. Marsh, W8QAH/K9BRK
19923 W. Norman St.
South Bend, Indiana 46637

Short Wave Broadcasting

Editor, *CQ:*

The comments re: short wave broadcasting in the HAM CLINIC in the August and December issues of *CQ* interested me, and as a former member of the Science Advisory Board of the Voice of America and as one who has had long experience in military and naval communications, I might make some comments in defense of h.f. broadcasting.

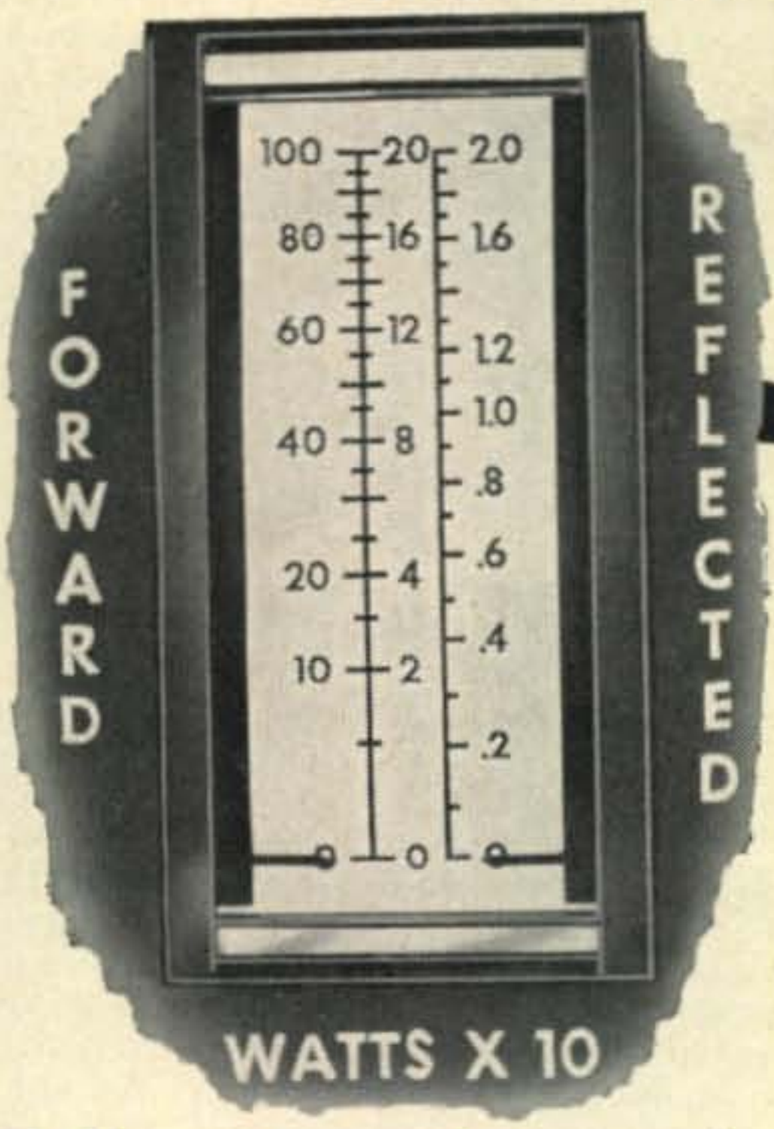
First, let me say that in my grammar and high school days I was an s.w.l. before I was an amateur. I "cut my teeth" on experimenting and building my own short wave receivers, listening to faraway places and enjoying hearing of other countries and peoples. This interesting and challenging form of entry into radio is something which most amateurs today have missed, because they have unfortunately taken the deplorable route of "memorize the exam" and "buy the ready-made plug-in appliance" into radio. Thus, please forgive me if I tend to become the "devil's advocate" re: h.f. broadcasting, for I can see it in its proper perspective, whereas most amateurs do not. My consulting engineering and military background helps in this, also. Personally, I would not have an amateur-band-only receiver or transceiver in the house, for I still find much of value in listening to the *whole* h.f. spectrum, as well as to l.f. and v.l.f.

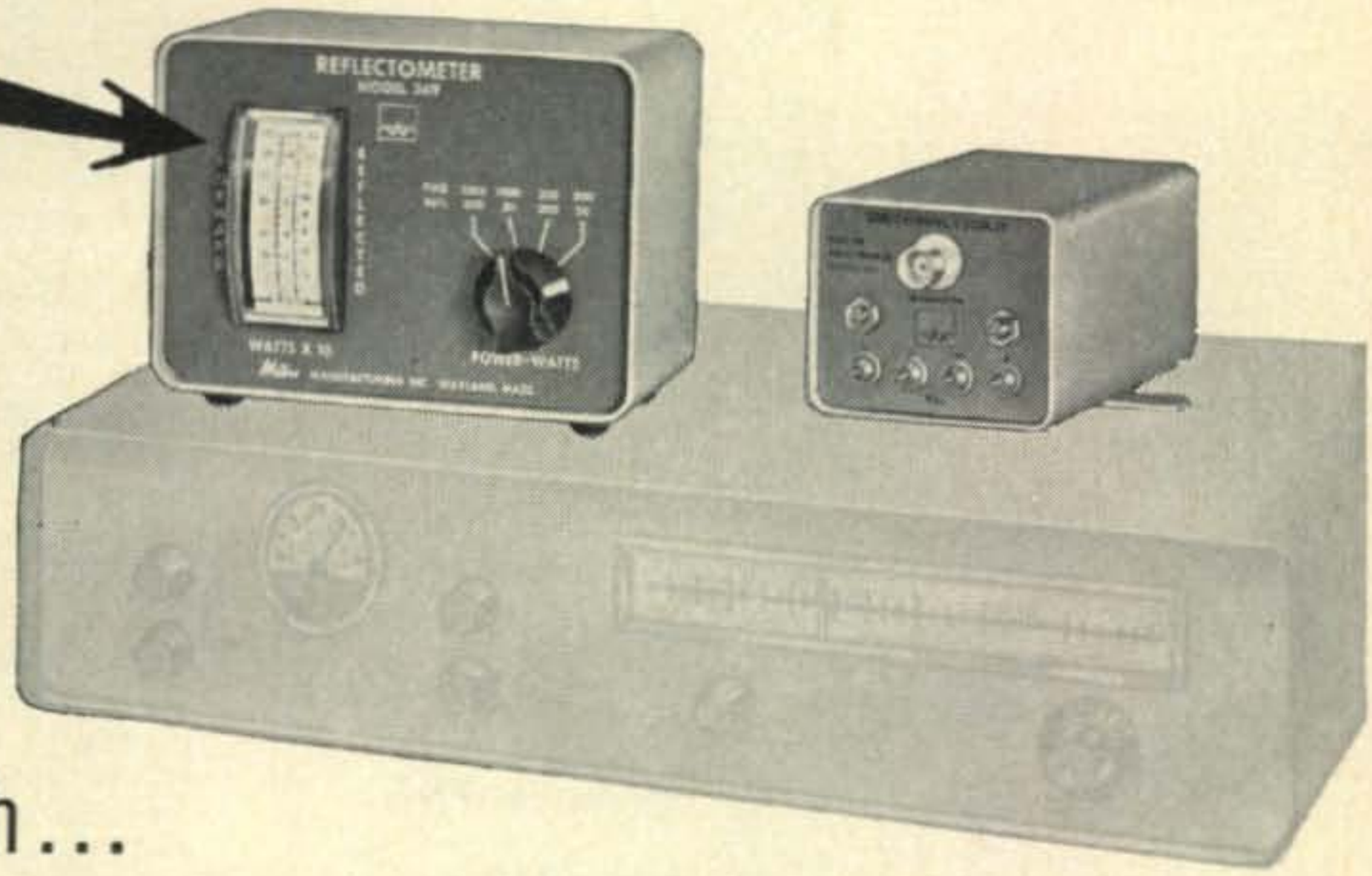
In the United States we have inflicted upon us a "juke box" type of m.f. broadcasting, with disc jockeys, groaners, and commercial spot and record grinders of 250 watts power and up in every town and hamlet the country over. I think I am safe in saying that with the latest (2 December) FCC count of a.m. stations on the air (4018), there are very few square miles of territory that do not have primary service. This coverage is in many cases duplicated on f.m. Also, it is since the advent of that "vast wasteland of TV", to use former FCC Chairman Minow's words, that a.m. and f.m. have become this type of "juke box monster," for the good network shows of the old days have gone from radio.

Most other countries are not so fortunate (?) as to have this saturated coverage of commercial radio with its free speech, in the three modes of a.m., f.m. and TV. Foreign broadcasting is controlled mostly by the national

AND NOW... from Waters the

REFLECTOMETER





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Frequency Range ..3 to 30 megacycles.
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Size...Indicator - 5½ x 3¾ x 4¼ in.
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Operates from 2 to 230 megacycles at 52 ohms. Measures RF output in watts up to a full kilowatt. Three calibrated scales insure accurate readings. Compact and weighs but 12 lbs.

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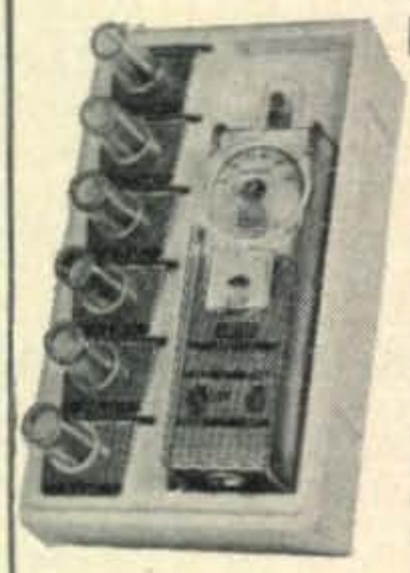

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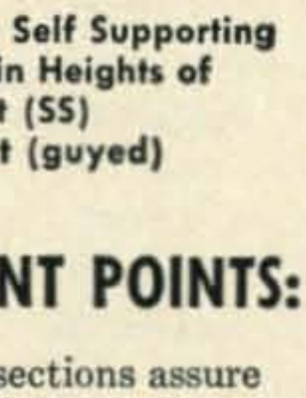

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governments, and stations are few and far between in many countries. This is especially true in the underdeveloped countries and the newly emerging countries such as those of Africa, the Middle East, and Asia. They do not have as many centers of population as we do, and their peoples are scattered and out of range of m.f. broadcast stations in these centers of population. These countries cannot support extensive and costly internal communication systems, either. In the countries of the tropical belt, m.f. coverage is severely restricted by the year-round ambient noise level. The only way by which these scattered populations can at present be reached is by h.f. broadcasting, and each country has the right to use this form of communication to its people and to its neighbors. These people are hungry for knowledge and enlightenment. In this world of competition between basic ideologies, a competition which is a life or death struggle, every possible means must be employed to carry the truth to these people. Farmers, plantation owners, sheepherders, and even tribes, have taken to the all-band transistor radio as their only means of contact with the outside world. In this country we know little of the all-band transistor radio, which is standard in foreign lands. Here it is something of a curiosity, for we listen to our record grinders on our little m.f. transistor sets which cover only one band, and we have no need of the rest of the spectrum, nor any appreciation of what it would be like not to be able to hear any m.f. record grinder, but to have to depend on h.f. Thus we see only one side of the story.

Surely, the h.f. broadcast stations require spectrum space. Surely they are in the U.S. amateur bands, and if we are not careful they will be in more of them, by international regulation. In passing I might make another statement which may bring down the wrath of many amateurs, and that is in regard to the stupid amateur who thinks it quite stylish to set his frequency on that of the BBC on 3952.5 or 7130 kc, or on some other such frequency in use. I quote from the Communications Act of 1934, Section 303 (m)(1) "(The FCC shall) have authority to suspend the license of any operator upon proof sufficient to satisfy the Commission that the licensee . . . (E) Has willfully or maliciously interferred with any other radio communications or signals . . ." This practice is illegal and it should not happen. This is just one of the things that we should clean up in our own operations if we are to present a proper public image to the rest of the world.

With regard to the statement that other countries should develop their own internal communications before venturing into h.f. broadcasting, this will also require much spectrum space. Again, in and between countries which have few large centers of population, h.f. is at present the most feasible and economical means of point-to-point communications over the distances and sparsely populated areas involved. Until satellites become plentiful and inexpensive, and until every farmer, plantation owner, sheepherder or tribal chief can have his own low cost (under $25) satellite terminal, h.f. radio via his all-band transistor receiver will be the only economical means of reaching him from the outside world.

I do not agree with the oft-quoted party line that the amateur is the only one with any rights in the amateur bands and other services had better get out "or else." With this attitude we are like the proverbial ostrich with his head in the sand, hoping that the problem will go away. Instead of griping about other countries and other services and their spectrum usage and requirements, let's look at the whole picture in proper perspective, and then take a critical look at ourselves in the light of reality. Let's support our FCC' plan for incentive licensing, let's improve our technical knowledge, let's improve our own operating practices, let's clean up our signals, and let's improve our own public image by being a *service* rather than a group of selfish hobbyists who think we own and have exclusive rights to our frequency bands. Then we will have some cause to point with pride to our own amateur service when we try to do "missionary work" for amateur radio among other countries.

A subscription to the ITU's *Telecommunications Journal* will help the disbeliever find truth in my statements.

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- Input 2000 Watts PEP, 1000 Watts CW, 400 Watts AM
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The GSB-201 Linear Amplifier makes an ideal fit into any high frequency system. It provides high performance in a compact handsome package at a comfortable price.

Gain — 10 db worth on the 80, 40, 20, 15 and 10 meter bands.

Input — Maximum power ratings are 2000 watts PEP, SSB, 1000 watts on CW, 400 on AM.

Exciter — Any SSB unit capable of delivering 65 to 100 watts output.

Circuits — Grounded-grid for max stability — low cost 811A tubes — silicon rectifiers for dependability.

Plus — A built-in antenna changeover relay, switchable panel meter to indicate plate current or power output, and a switch facility for preliminary tuning at low power.

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For further information, check number 14, on page 110

This is not meant to be critical of the writer of the HAM CLINIC, for I know not his views on incentive licensing, etc. Rather, this is meant to give the average reader of the magazine a little more insight into the problems we face. We are too prone to be the "ugly self-satisfied American" who says, "We have it and you can't take it away from us." or "The heck with what the foreigners think." A tour of duty overseas for each amateur would either "kill or cure" those with such attitudes.

Captain Paul H. Lee, USNR, W3JHR
5209 Bangor Drive
Kensington, Maryland 20795

He's Right: We're Wrong

Editor, *CQ:*

Re: "Surplus Power Transformers," by W. I. Orr, in the October 1965 issue. Fig. 2 is apt to mislead a reader who is unfamiliar with the subject. The VA rating of a transformer is limited by the *cross-sectional* area of the core, and this is measured in the same plane as the winding. The illustration shows a section across the winding (rather than across the core); the dimensions of the core in this plane are completely unrelated to the power rating.

In R. L. Ives' "Deluxe Q5'er Conversion" in the same issue: is the wiring correctly shown at the right-hand end of fig. 7? That jack labelled "Aux. Input" is hooked up as an *output* jack. If I understand the author's purpose correctly, the Q5'er output would be 100% noise.

Remsen T. Schenck
Franklin Hill Rd.
RFD 3, Bangor
Penn. 18013

Zero Bias [*from page 7*]

we've only scratched the surface. True, we have been able to get amateur stations into a few hundred movie theaters across the country during recent months. We've also been responsible for getting amateur radio featured on at least five local New York radio broadcasts this year. Still, nowhere near the job that should be done.

Who can do the job? ARRL! Who should do the job? ARRL!

While the league sits complacently on its million dollar-plus bank account, reviewing the situation, we're losing precious time that can never be recovered. The league has pointed with pride to its shiny new headquarters, donated by amateurs across the land. And with a million dollars or more in cash and negotiable securities, the league is safely prepared to face any rainy day. Well, fellows, *it's raining!*

We challenge the American Radio Relay League to make a fresh start towards building amateur radio. Sure, W1AW is doing a fine job for those who need code practice. The only thing wrong is that there are too few newcomers to take advantage of it.

What amateur radio needs is image. The only answer is high-speed, professional public relations. The talent is available, obviously. Let us convince the league of the need to buy some. The league is our voice. Let's hear that voice, *now!*

73, Dick, K2MGA

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AOM-106	1 cps	19.95
AOM-201	100 kc and 10 kc	35.00
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AOM-1000X	1,000 kc oscillator	32.50

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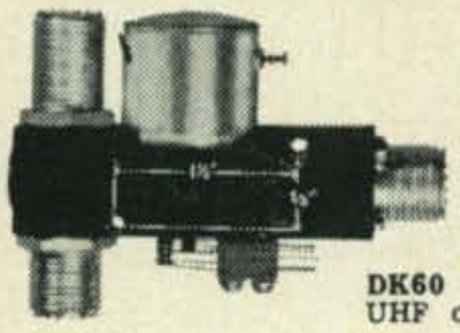

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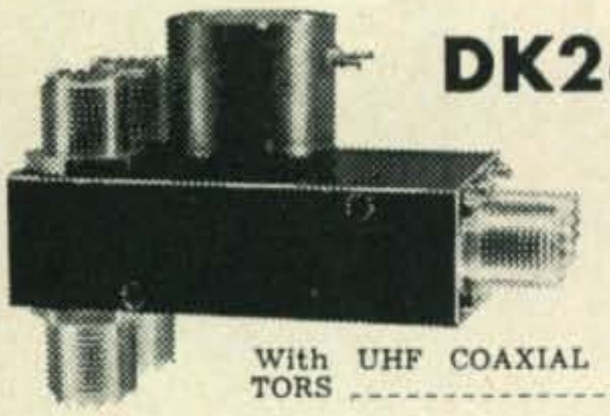

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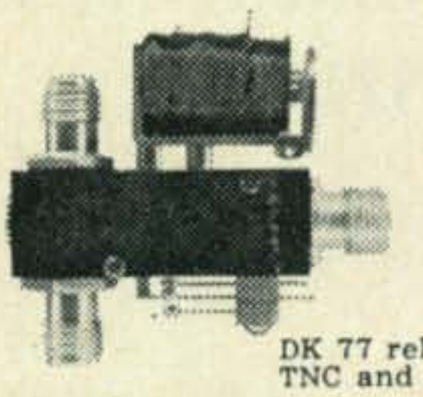

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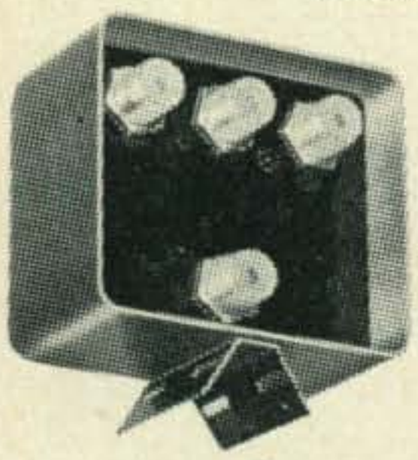

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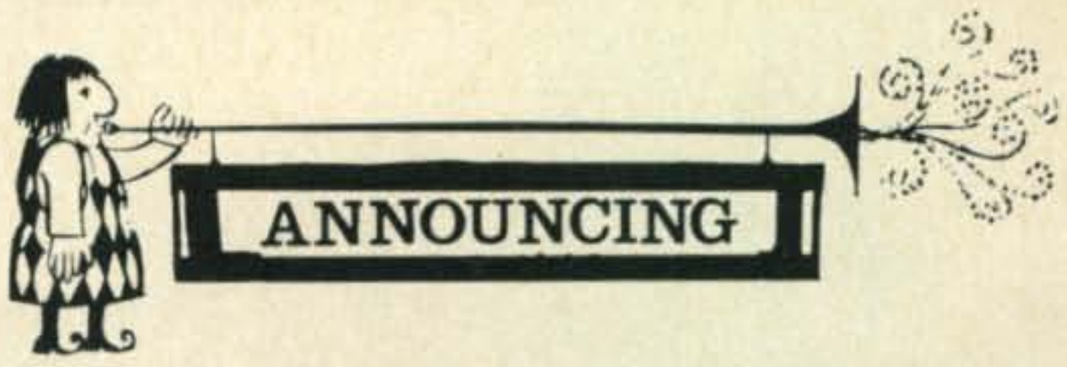


Endwell, New York

The Old Timers Club of The Southern Tier and Broome County, New York, are sponsoring a new chapter of the Quarter Century Wireless Association for upstate New York, to be known as the Central New York State Chapter. It is hoped that this Chapter will serve all QCWA members residing in eastern, central and parts of western New York State. Its purpose will be to promote fellowship among QCWA members and for renewing acquaintances in the radio amateur fraternity at least once annually. It is hoped that membership will consist of at least fifty members so that a QCWA banner may be awarded to this new Chapter. All QCWA members residing in upstate New York are invited to join this new Chapter. For further information, please write Lt. Colonel (Ret.) Best E. Martin Jr., K2LBB/W3NT, 3646 Rath Street, Endwell, New York 13760.

Chicago, Illinois

The 5th Annual Banquet of the Six Meter Club of Chicago will be held on Saturday, March 5th, 1966 at 8:00 P.M. at the Park Manor VFW Hall, 1301 West 87th Street, Chicago, Illinois. Donation $4.00 per person. Tickets available from the following officers until February 26, 1966: W9AVB, Robert Weiss, 6339 South Kostner, Chicago; K9DKI, Henry Dziekan, 4931 South Keeler, Chicago; and K9ZWV, Val Hellwig, 3420 South 60th Ct., Cicero, Ill.

Dayton, Ohio

The Dayton Hamvention will be held on April 16, 1966. It is the 15th annual meeting of the Dayton Amateur Radio Association, one of the largest amateur meetings in the U.S. with emphasis on the technical side of amateur radio. Program includes technical sessions, exhibits, Home Brew contest, Hidden Transmitter Hunt, women's activities, Flea Market and FCC general class examination. The place for the Hamvention will be Wampler's Ball-arena, Dayton, Ohio. Information is available from the Dayton Hamvention, Dept. G, Box 44, Dayton, Ohio.

Binghamton, New York

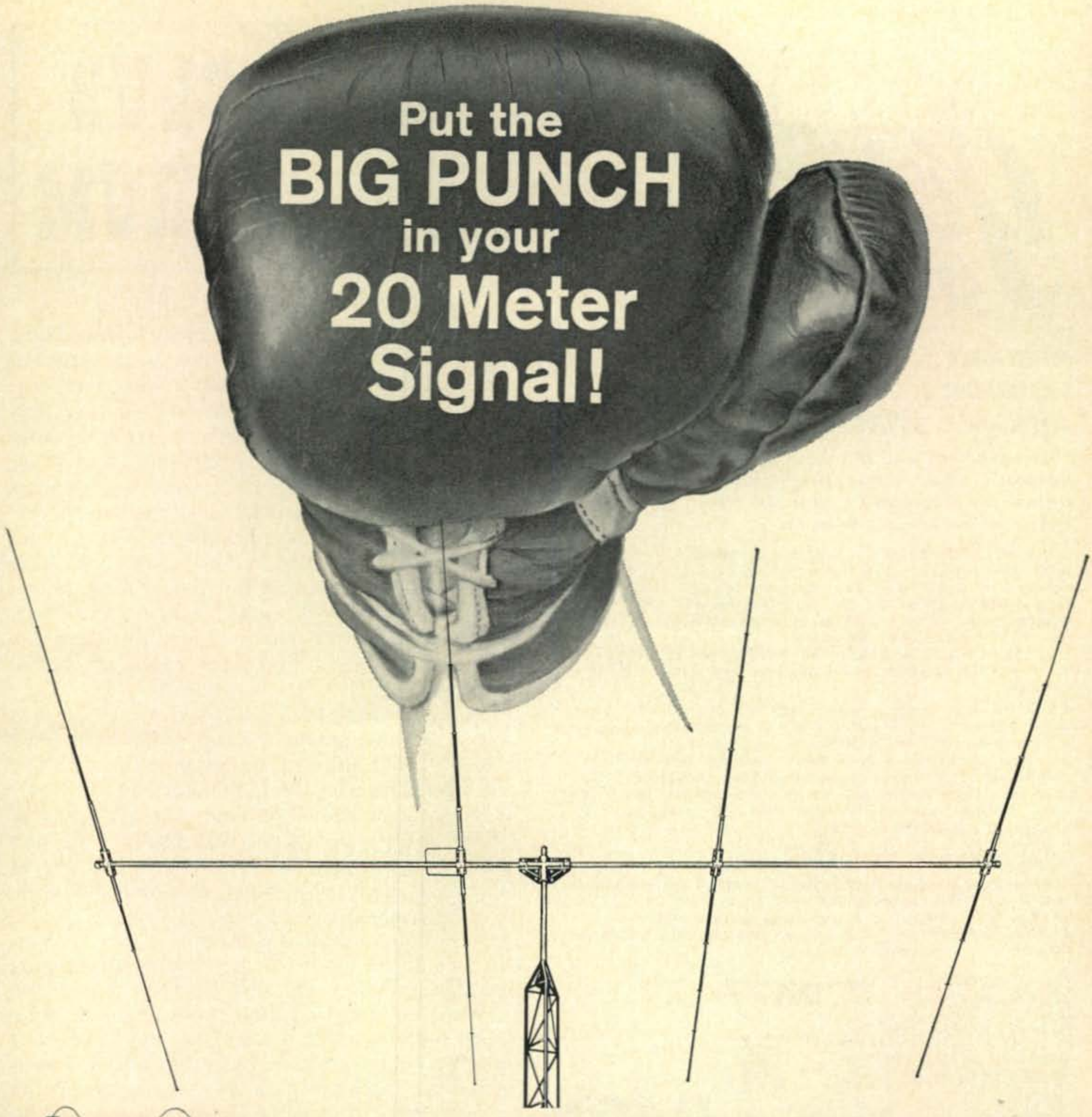
The Southern Tier Radio Clubs will hold their 7th Annual Ham Fest and Dinner on March 19, 1966. The dinner will be held at St. John's Memorial Center, Hally L. Drive and Virginia Street, Johnson City, New York. The doors will open at 5:00 P.M. and dinner will be served at 7:00 P.M. Further information, tickets and reservations may be obtained from Harry Spencer, W2SDA, 1165 Vestal Avenue, Binghamton, New York, 13903. Tickets are $3.75 for adults, $1.75 for children. For mobile talk-in, call K2ERQ/2 on 50.4 mc.

Columbus, Georgia

The Columbus Amateur Radio Club, Inc. will sponsor the Annual Columbus Hamfest, to be held this year, on Sunday, March 27th, at the Fine Arts Building located at Fairgrounds. For reservations or information, contact W4FIZ, 3804 Conrad Drive, Columbus, Ga. 31904.

Forest Hills, N.Y.

A new radio club has been formed for mobile operators only. Called the Long Island Mobile Amateur Radio Club, they publish a periodical called the *LIMARC Log* which contains information on meetings and general topics. Anyone interested in joining this club please contact Ernest Juhn, 109-01 72nd Road, Forest Hills, N.Y. for complete details.



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If working 20 meters is your cup of tea and you're looking for sensational DX performance, you want Hy-Gain's Model 204BA. Four full-spaced elements that are factory pre-tuned using Hy-Gain's exclusive Beta Match provide optimum gain on phone or CW across the entire 20 meter band. Outstanding F/B and F/S ratios insure maximum discrimination of unwanted signals for peak performance. Tailored for installation on a lightweight tower using a standard Ham rotator, the Model 204BA employs the very latest in construction concepts...will provide years of reliable all-weather performance. Compatibly stacks with other beams.
A real buy at **$99.95** Net

Other Optimum Performance Hy-Gain Monobanders

For 40 Meters—Full-spaced 2-element Model 402BA .....$99.75 Net
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Get Yours Today From Your Favorite Hy-Gain Distributor or write

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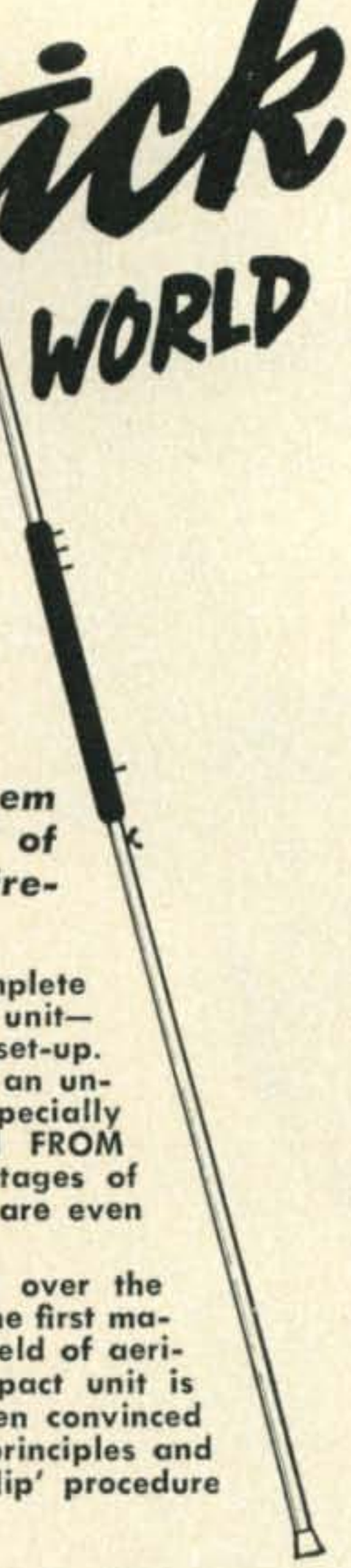
For further informatino, check number 17, on page 110

Joystick SPANS THE WORLD



VARIABLE FREQUENCY ANTENNA SYSTEM

This exclusive and amazing system possesses the unique property of an even performance over all frequencies between 1.4-30 Mc/s.

Every JOYSTICK System is supplied complete with feeder and an antenna matching unit—selected by you to suit your personal set-up. It is ready to go on the air and gives an unprecedented 'lift to signal strengths especially for 'cliff' and 'cave' dwellers—EVEN FROM UNDERGROUND! Naturally the advantages of using the 'JOYSTICK' 'up-in-the-clear' are even greater!

4,000 licensed stations and SWLS all over the world have already found that this is the first major break-through for 20 years in the field of aerials. The performance for such a compact unit is staggering. Even the skeptics have been convinced once they have understood the basic principles and have followed the simple 'load and dip' procedure given in the instructions.

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ZL4GA WORKS G5WP ON 80 METRES

INDOORS—ZL4GA's JOYSTICK got him 569 on 3.5 mcs from G5WP on 21st February, 1965 at 0850 GMT. Alan had worked VE7BIY on 3.5 mcs at 559 and also logged 59 countries on 14 m/cs by that date, including LUTHBS and 9M4LP. *Testimonials continue to pour in—read W7OE's fantastic results!*

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For further information, check number 18, on page 110

CLUB FORUM

AL SMITH,* WA2TAQ

RECOGNITION for Amateur Radio Clubs will take place at this years Hudson Division ARRL Convention. The program committee has announced that time will be allotted for Forums on both amateur radio clubs and press and public relations. Convention emphasis on these important aspects of amateur radio have long been awaited by this writer. This 1966 convention scheduled for October 15 and 16, 1966 is to be held in Tarrytown, N.Y. This too is another departure in amateur radio in this area as this affair is usually held in New York City. With a vast parking area available the convention should make for excellent mobile activities.

It has always puzzled this writer that Forums on clubs and amateur radio press have been among those missing at our conventions. The strange thing about it is that for the most part it is amateur radio that puts these affairs on. What an opportunity this will provide for club officers to compare notes, programs, and discuss the trials and tribulations of running a club. Convention activity of this type could revolutionize both clubs and conventions. The subjects that could be discussed are endless and finding enough time may well turn out to be a problem.

Most large organizations (outside of the amateur radio world) realize the importance of placing emphasis on Press and Public Relations activities. One such national group sets aside an evening prior to regular convention activities to conduct a Press and Public Relations dinner, feting the members engaged in press activities. In addition they take advantage of the opportunity to invite local newspaper representatives so as to kindle good press relationships. One highlight of a press dinner is the awarding of prizes for the best publication (club) in the various classes of reproduction. This "incentive" feature goes a long way to improve our club publications.

The CLUB FORUM extends somewhat belated but hearty congratulations to the Joliet (Illinois) Amateur Radio Society on reaching their twenty fifth year of existence. To commemorate this quarter century the club published a 36 page booklet compiled by Joseph Blahunka, W9RCJ. The booklet depicts the history of the club since its inception in September 1940. This impressive record is one that any club would be proud to display. Perhaps one of the more outstanding

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NOW! A 3-BAND SSB TRANSCEIVER KIT FOR 189.95

NEW EICO 753 SSB/AM/CW 3-BAND TRANSCEIVER

WITH SILICON SOLID STATE VFO

Build the finest of SSB/AM/CW 3-band transceivers with 200 watts of SSB punch and every wanted operating facility, plus the extra reliability and maintenance ease inherent in kit design. Assembly is made faster and easier by VFO and IF circuit boards, plus preassembled crystal lattice filter. Rigid construction, compact size, and superb styling make this rig equally suited for mobile and fixed station use. The new EICO 753 is at your dealer now, in kit form and factory-wired. Compare, and you will find that **only the 753 has all these important features:**

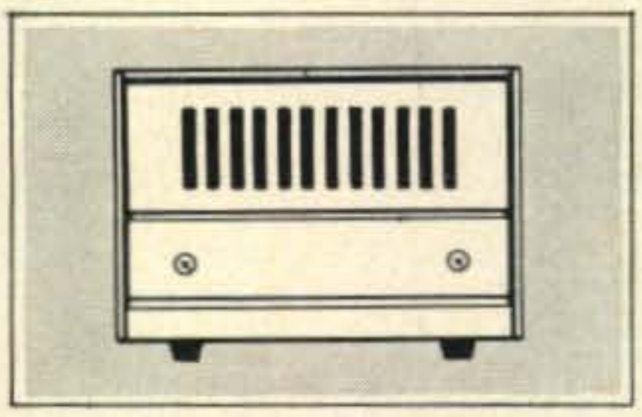
■ Full band coverage on 80, 40 and 20 meters. ■ Receiver offset tuning (up to ±10kc) without altering transmitter frequency. ■ SILICON SOLID-STATE VFO for drift-free and voltage stable operation in both fixed and mobile installations. ■ Built-in VOX. ■ Panel selected VOX, PTT & STANDBY. ■ High level dynamic ALC to prevent flat-topping or splatter and permit the use of a linear amplifier. ■ Automatic carrier level adjustment on CW and AM. ■ Dual ratio ball drive permits single knob 6:1 rapid tuning and 30:1 vernier bandspread (over 10 degrees of scale). ■ Position of hairline adjustable on panel. ■ Illuminated S-meter/PA Cathode Current Meter and tuning dial. ■ Fast attack, slow decay AGC. ■ Grid-block break-in CW keying. ■ Product detector for SSB and CW, triode detector for AM. ■ TR relay with auxiliary contacts for use with high power linear amplifier. ■ Includes mobile mounting bracket.

ADDITIONAL SPECIFICATIONS

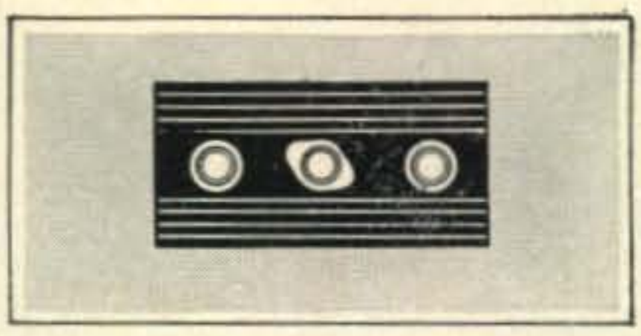
FREQUENCY COVERAGE: 3490-4010kc, 6990-7310kc, 13890-14410kc. SSB EMISSIONS: LSB 80 and 40 meters, USB 20 meters. RF POWER INPUT: 200 watts SSB PEP and CW, 100 watts AM. RF POWER OUTPUT: 120 watts SSB PEP and CW, 30 watts AM. OUTPUT PI NETWORK MATCHING RANGE: 40-80 ohms. SSB GENERATION: 5.2 Mc crystal lattice filter; bandwidth 2.7kc at 6db. STABILITY: 400 cps after warm-up. SUPPRESSION: Carrier-50db; unwanted sideband-40db. RECEIVER: Sensitivity 1uv for 10db S/N ratio: selectivity 2.7kc at 6db; audio output over 2 watts (3.2 ohms). PANEL CONTROLS & CONNECTORS: Tuning, Band Selector, AF Gain, RF Gain, MIC Gain with calibrator switch at extreme CCW rotation, Hairline Set (capped), Mode (SSB, AM, CW, Tune), Function (Off, Standby, PTT, VOX), Carrier Balance, Exciter Tune, PA Tune, PA Load, Receiver Offset Tune, MIC input, phone jack. REAR CONTROLS & CONNECTORS: VOX Threshold, VOX delay, VOX sensitivity, Anti-VOX sensitivity, PA Bias adjust, S-Meter zero adjust, power socket, external relay, antenna connector, key jack, accessory calibrator socket. METERING: PA cathode on transmit, S-Meter on receive. SIZE (HWD): 5 13/16" x 14¼" x 11¼". POWER REQUIREMENTS: 750 VDC at 300 ma, 250 VDC at 170 ma, -100 VDC at 5 ma, 12.6 VAC at 3.8 amps.

The Model 753 is an outstanding value factory-wired at $299.95.

Power Supplies Tailored for Optimum Performance of the 753.



Model 751 Solid State AC Supply/Speaker Console.
Matching table-top companion unit. Built-in PM speaker.
Kit $79.95 Wired $109.95



Model 752 Solid State Mobile Supply.
For use with 12 volt positive or negative ground systems. Fully protected against polarity reversal or overload.
Kit $79.95 Wired $109.95

EICO For FREE Catalog and 753 Spec. Sheet write to EICO Dept. CQ-3
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DART-LINE

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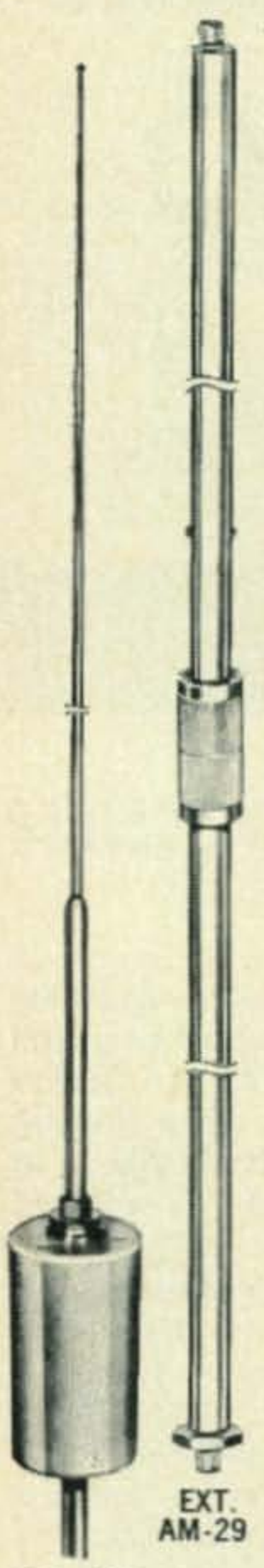
FOLD-OVER ANTENNA & COILS

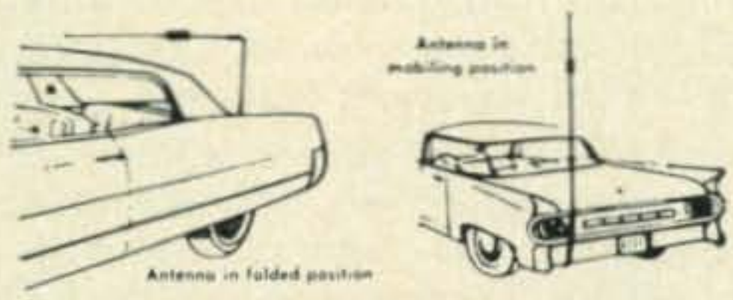


COIL AND WHIP

EXT. AM-29

10-15-20-40-80 METERS

New 36" and 48" Stainless Steel Laydown Extension used in conjunction with miniaturized coils, capable of handling 500 Watts AM. Adjustable one-piece whip and coil moves in and out of resonant frequency. Coils are 2⅛" in dia., lengths range from 2" to 7" depending on desired band operation. Antenna coils de signed specifically to handle high power mobile operation while utilizing the small streamlined antenna design normally desired for low powered mobiles. Extension lays over at 18". Extension, coil and whip maximum height 82". Constructed of stainless steel with brass fittings, corrosion resistant, weatherproof. Slim locking sleeve holds a rigid vertical position, extremely convenient in clearing garage doors, car ports and low overhangs. Extension terminates in a ⅜"-24 stud at both ends for additional uses.



BANDWIDTH RESONANT FREQUENCY				
10 Meters — Approx.	100	to	120	KC
15 Meters — Approx.	100	to	120	KC
20 Meters — Approx.	80	to	100	KC
40 Meters — Approx.	40	to	50	KC
75 Meters — Approx.	25	to	30	KC

POWER RATING: AM-dc input, 250 Watts - SSB-dc input 500 Watts

AM-29	36" Stain. Steel Laydown Ext. Breaks at 18" (Fender or Deck Mt.)	$11.95
AM-35	48" Stain. Steel Laydown Ext. Break at 36" (For Bumper Mt.)	14.25
AM-30	80 Meter Coil & Whip	9.95
AM-31	40 Meter Coil & Whip	8.95
AM-32	20 Meter Coil & Whip	7.95
AM-33	15 Meter Coil & Whip	6.95
AM-34	10 Meter Coil & Whip	5.95

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Master Mobile Mounts

WHITEHALL ELECTRONICS DIV OF CORPORATION

4125 W. JEFFERSON BOULEVARD

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For further information, check number 20, on page 110

A darkened view of the club house belonging to the Joliet Amateur Radio Society.

achievements of the group is the construction of its own clubhouse on a three acre plot. The club also can boast of two generators a 12.5 and 1.5 kw. In addition they have a 60 foot four legged former commercial radio tower with a TA-36 beam swinging in the breeze.

The members of the Joliet Amateur Radio Society can also be justly proud of their contribution to public service in their city. Their colors have been shown through the years in many emergencies such as floods, snow storms plus things like providing communications for parades and halloween patrols.

Of course the fun side of our avocation enters into the picture with JARS participating in Auctions, Dinners, Fox Hunts etc. Their Field Day record could vie for honors with any club. This past year they placed 2nd making 1,272 contacts. As recently as November 12, 1965 they mustered 79 mobiles to assist in a tornado that struck their area. They provided communication to many areas that were completely cut off due to the effects of the storm.

Their publication *Groundwaves* is good and provides club members with the latest doings in the club. Editors are K9QMO and W9DBJ. Club prexy for 1966 is Barry Boothe, W9UCW. Last year's President was Henry Kampe, W9OKM.

The Honorable Maurice Berlinsky, Mayor of Joliet put the finishing touches on the joyous twenty five year celebration of JARS by issuing a proclamation designating the week of September 27 to October 2 as Amateur Radio Week in Joliet.

All in all the Joliet Amateur Radio Society represents a portion of our avocation of which we are justly proud. Congratulations OMs and may your next twenty five be every bit as successful as the first.

New Clubs

The Long Island area has a new exclusively mobile club. Known as the Long Island Mobile Amateur Radio Club the group has set the first Tuesday of the month as their meeting night. Temporary officers were elected at the first organizational meeting they are: President, Ed.

[*Continued on page 94*]

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WHAT'S FREE IN NEW YORK?

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THAT'S WHAT!

IT'S THE SHOW YOU WON'T WANT TO MISS!

Here's your big opportunity to see the newest Ham gear from the leading manufacturers, and to talk directly with the factory people. All at the 1966 Single Side-Band Show, Tuesday, March 22nd, from 11 AM to 9 PM. Everyone is invited! Come to the Penn Top Room of the Statler-Hilton Hotel, 7th Avenue and 33rd Street, New York City (opposite Pennsylvania Station).

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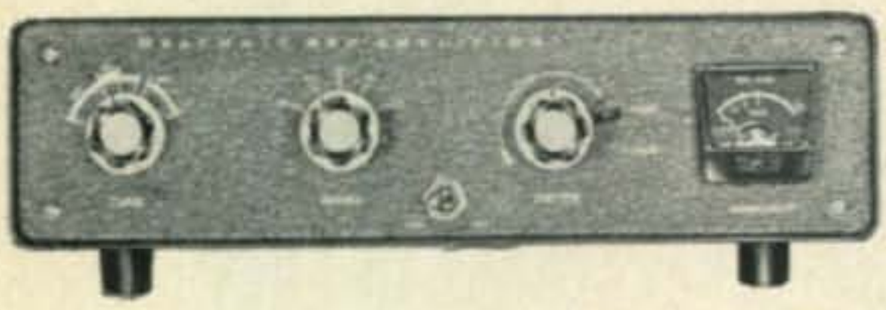

HA-14
$99.95

World's Smallest KW SSB Linear! . . . 1000 watts P.E.P. input SSB. Tunes 80–10 meters. ALC output to exciter. Built-in antenna change-over relay. Built-in SWR meter. Operates fixed or mobile with appropriate power supply. Drive with 100 watt exciter. Perfect final for Single-Banders.
Kit HA-14, 10 lbs. **$99.95**
Kit HP-14, Mobile Power Supply (12 v. neg. gnd.), 10 lbs. **$89.95**
Kit HP-24, AC Power Supply, 22 lbs. **$49.95**

"Single-Bander" 200-Watt P.E.P. Input SSB Transceivers

HW-12
Choose 80, 40, or 20 meters
$119.95

Go SSB Fixed Or Mobile On The Band Of Your Choice . . . with built-in PTT and VOX. Designed for fast, easy assembly. **Kit HW-12** (80-meter), **Kit HW-32** (20-meter), **Kit HW-22** (40-meter), 16 lbs. . . . . each **$119.95**
Kit HP-13, Mobile Power Supply (12 v. DC), 7 lbs. **$59.95**
Kit HP-23, AC Power Supply, 19 lbs. **$39.95**

HR-10 & DX-60A "Combo" . . . Perfect For The Novice

Here's inexpensive amateur radio . . . yet the finest quality! HR-10 provides amateur band coverage 80-10 meters with xtal filter, calibrator, BFO, S meter & AVC. Receives AM, SSB, & CW. 1 uv sensitivity. Excellent stability.
Kit HR-10, 20 lbs. **$75.00**

HR-10
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DX-60A provides 90 watts AM or CW with low harmonic output from xtal control or external VFO. Will run reduced power for novice class. Use it with the HD-10 Electronic Keyer.
Kit DX-60A, 24 lbs. **$79.95**

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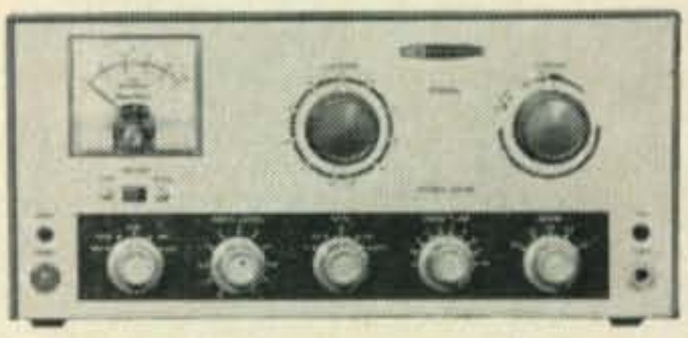
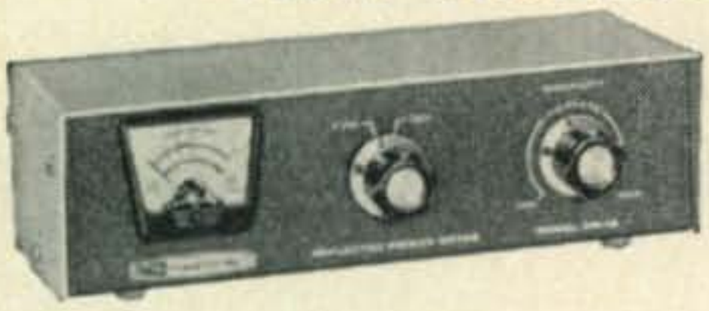


New! SWR Meter . . . Build It & Use It In One Evening



HM-15
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Kit HM-15, 3 lbs. **$14.95**

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Most Popular Amateur Scopes! "Ham-Scan" shows signals 50 kc's on each side of receiver tuning.
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HO-10 shows actual quality of transmitted & received signals.
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For Complete Descriptions See Your 1966 Heathkit Catalog

Kit HM-10A Tunnel Dipper outperforms the grid-dip meter. 3 lbs. **$34.95**
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SB-110 6-Meter SSB Transceiver . . . $320.00

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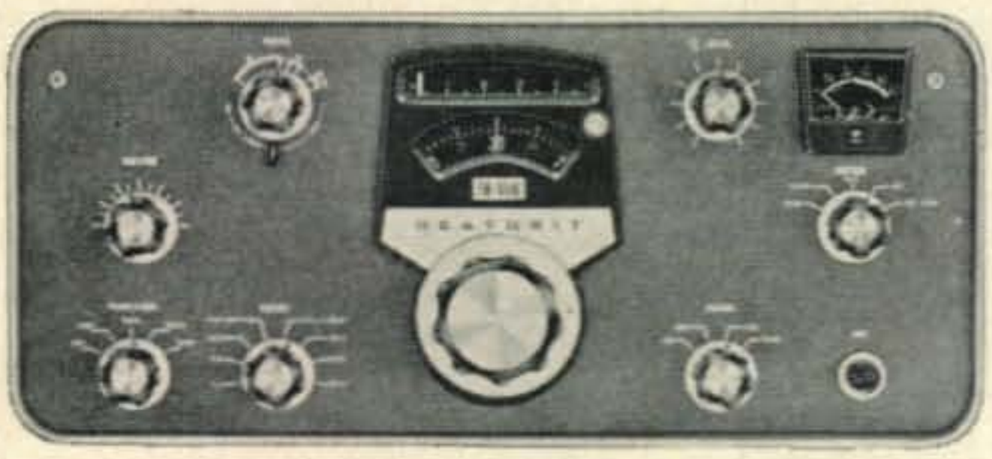

SB-400 Deluxe SSB Transmitter . . . $325.00

• Built-in power supply • Complete transceive capability with SB-300 receiver • Linear master oscillator frequency control • Built-in antenna change-over relay • All crystals supplied for complete 80-10 meter coverage • Automatic level control for higher talk power, minimum distortion • 180 watt PEP SSB, 170 watts CW • Crystal filter type SSB generation (upper or lower sideband) • VOX operated CW uses CW sidetone • 1 kc dial calibration—100 kc per dial revolution • 500 kc coverage per bandswitch position • Weight 34 lbs.

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• 1200 watts P.E.P. input SSB—1000 watts CW • 80 through 10 meter band coverage • Built-in SWR meter —Antenna relay—Solid-state power supply • Automatic Level Control (ALC) • Shielded, fan-cooled amplifier compartment • Pre-tuned cathode input circuit for maximum efficiency & low distortion • Circuit-breaker power supply protection—no fuses • Designed for 120/240 volt operation • Weight 41 lbs.

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For further information, check number 25, on page 110

THE G2DAF LINEAR AMPLIFIER

BY C.W.O. JOSEPH DEMPSEY,* WA6JCM/4

If you would like tetrode advantages with zero bias triode simplicity, try this circuit in your next linear amplifier.

WHILE serving as custodian of MARS Station DL4OV, at the Signal Depot at Pirmasens, Germany, I had the good fortune of working a number of English hams and through the acquaintance of Mac, G3OEM, I was introduced to a new linear amplifier design which was developed by Dick Thornley, G2DAF. As this particular design reflects an entirely new approach to linear amplifier input circuitry, I feel that the following information will stimulate considerable interest among linear design enthusiasts.

Initial tests were undertaken with Bill, WA4-OUH, and Pat, WA4LWS, to determine the practicality of modifying conventional linears to incorporate the G2DAF circuit. At present there are two of these amplifiers modified and operating, a pair of 4-250A's and a pair of 4-400A's both of which have produced extremely gratifying results. For this article the 4-400 amplifier built by WA4OUH will be used to describe the desirable features of the G2DAF circuit.

*Det. B 27 Maintenance Battalion 1st Cav. Div. (Air Mobile) APO 96490.

Theory of Operation

As may be seen from fig. 1, the amplifier makes use of two diode rectifiers in a voltage doubler circuit to supply screen voltage. This gives approximately twice the screen voltage for the same r.f. drive voltage. The charging capacitors used in the circuit are chosen to offer a low impedance to the signal input frequency but a high impedance to all audio frequencies. The positive voltage on the screen grid is derived solely from the r.f. input signal and will always be in accordance with and directly proportional to the amplitude of the modulation envelope. The screen voltage is going from zero in a positive direction at the voice modulation frequency.

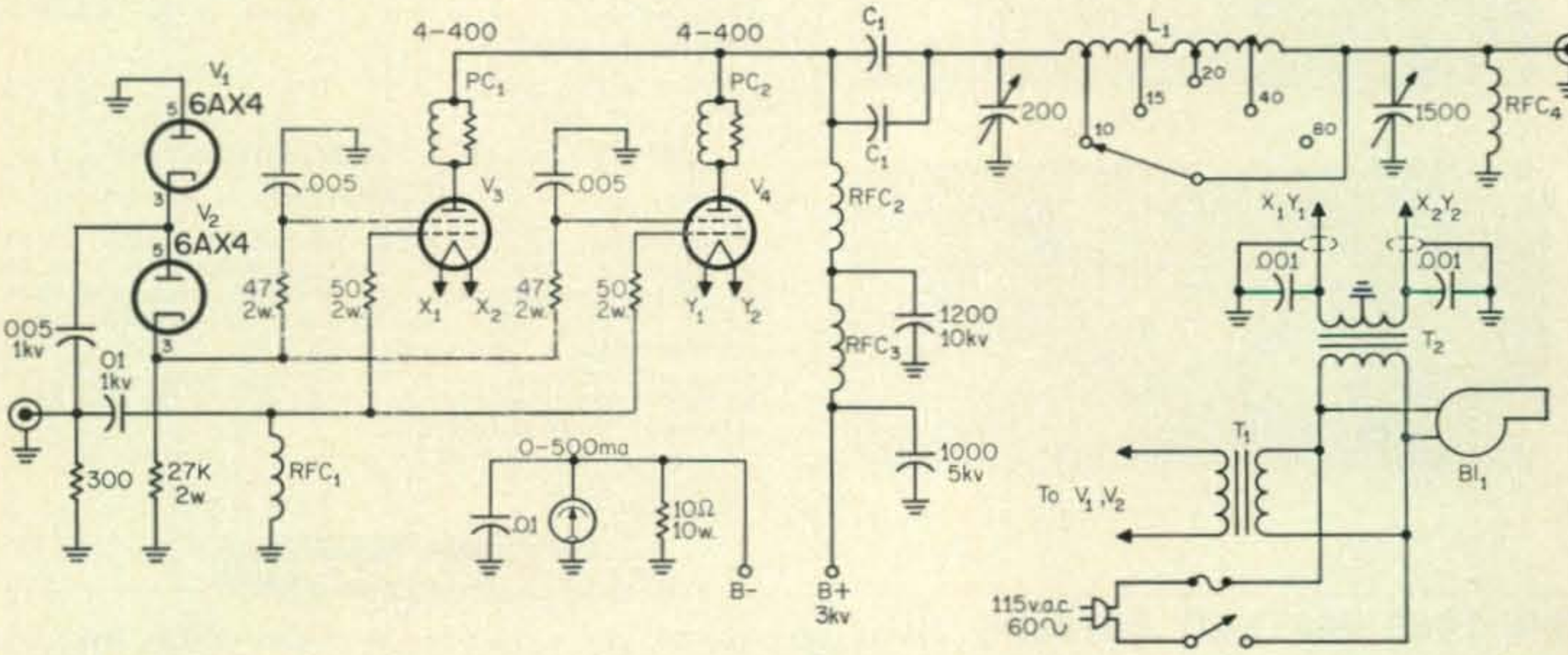

Fig. 1—Circuit of the G2DAF linear. All capacitors less than one are in mf and those greater than one are in mmf. Capacitors without a voltage rating are 1 kv disc ceramics. All resistors are ½ watt unless otherwise noted. The 300Ω resistor at the input should be non-inductive.

C_1—500 mmf ea., TV doorknob capacitors, 20 KV each.
L_1—Airdux pi coil, PI-195-2 or equiv.
PC_1, PC_2—four 220 ohm resistors paralleled by 3 turns of #14 e., 1½" dia.
RFC_1—2.5 mh, 200 ma.
RFC_2—National R 175 A or equiv.
RFC_3—Ohmite Z-50.
RFC_4—2.5 mh, 300 ma.
T_1—6.3 v at 2 amperes.
T_2—5 v c.t., 30 amperes.

Considering the input side of the amplifier only, the operation is Class B but the output side is more complex than conventional amplifiers because there is no reference point to plot the I_p/E_g curve. With conventional Class B operation, at zero bias, the plate current would be very high and it would be necessary to bias the grid to keep the plate current within manufacturers ratings. (See fig. 2A) The r.f. driving signal swings either side of a fixed reference point determined by the applied bias. Each positive half cycle drives the grid positive and the plate current increases in a linear manner. This increase can be plotted against the I_p/E_g curve to show plate pulse and current flow.

In the G2DAF linear there is no bias and the grid voltage is zero; at the same time the plate current is also low because there is no voltage on the screen grids. With a small r.f. input the screen voltage will rise slightly above zero and the plate current will rise by a small amount. The I_p/E_g curve will appear as shown in fig. 2B. The thing to note here is that the plate current is flowing for 360 degrees of the grid swing and the amplifier is now operating in Class A.

As the input signal increases, the screen voltage rises but the grid is still at zero bias with the r.f. signal swinging equally positive and negative around the zero bias point. What happens is that the I_p/E_g curve has, in effect, moved to the left as shown in fig. 2C. Now the plate current flow is more than 180 degrees but less than 360 degrees and the amplifier is operating in Class AB. As the drive signal is increased, the zero bias point moves further and the plate current flows for a smaller part of the grid swing and, as can be seen in fig. 2D, the amplifier is approaching Class B.

In regard to the operation of the amplifier at maximum signal levels, the plate current pulse of the G2DAF is greater than the plate current pulse of conventional linears which means that for the same maximum signal input power the G2DAF amplifier requires less driving voltage and for the same driving voltage, the amplifier will run to a greater power output.

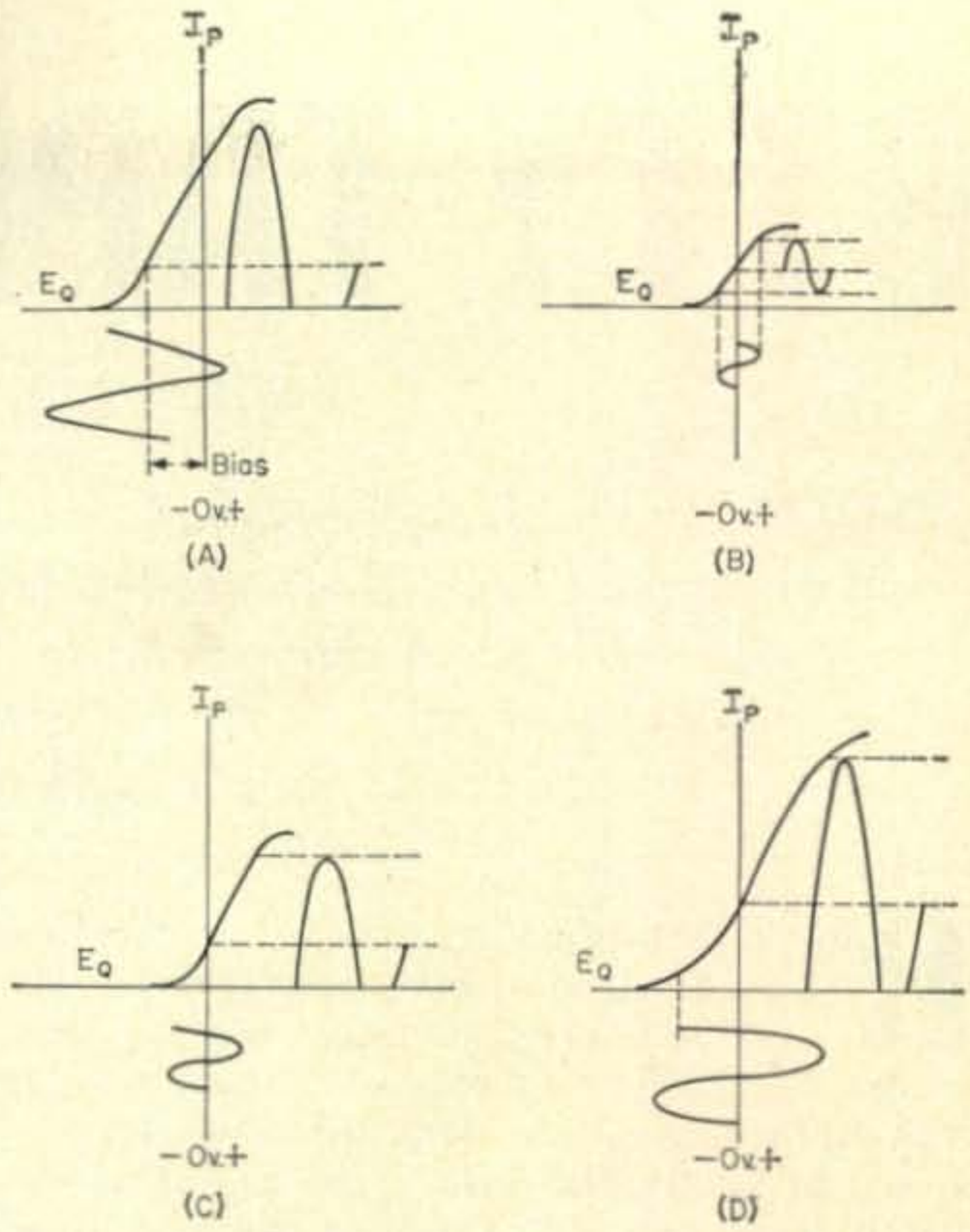

Fig. 2—(A) Conventional Class B operating point. Bias is used to reduce idling current to safe value. With no bias and no screen voltage the E_g I_p curve is as shown in (B) for small signal input. With increased input the curve is closer to Class AB as shown in (C). Further increase in input moves the operation closer to class B as shown in (D).

Construction Hints

The schematic shown was begun as a conventional linear using two 4-400s in grounded grid and prior to completion, modified to incorporate the G2DAF design.

Input Circuit—The exciter is loaded into the grid resistor which is 300 ohms non-inductive, and can be bought as such or made up of 2 or 5 watt carbon resistors in parallel. The wattage should be high enough to handle the output of the exciter used to drive the amplifier.

Three hundred ohms is used because the r.f. voltage developed across R_1 determines the screen voltage. If 50 or 72 ohms is used there will be inadequate screen voltage. For 4-400's the r.f. voltage should be about 400 volts r.m.s. as measured with a v.t.v.m. In other circuits that require less screen voltage, the size of the resistance can be lowered. There is ample room for experimentation to find the proper resistance for different tubes and power levels.

Grid Circuit—The r.f. input signal is fed through the 0.01 capacitor to the control grids of the tubes and since there is no voltage on the screen grids until this happens, no bias is used. With no voltage on the control grid and none on the screen, the static resting current for a pair of 4-400's with 3000 volts on the plate is 90 mills (45 for each tube). This, as stated earlier, is one of the advantages of this type of circuit in that the static resting current is much less than conventional linears and the tubes run much cooler.

Screen Grid—As excitation is applied to the grid resistor, a portion of the drive is fed through the 0.01 capacitor to the voltage doubler which rectifies, doubles and applies it to the screen grids. The diodes used should have high cathode insulation. TV damper diodes are recommended such as the 6AU4 or 6AX4. Type 6X4 tubes were used in this amplifier because there were plenty in the junk box. However, cathode insulation is insufficient, but so far none of them have failed. Solid state diodes can be used as long as they are r.f. types with suitable p.i.v. The 27K resistor from screen to ground provides a return path for the screens so don't omit it. The capacitors in the circuit have a high impedance to all audio frequencies but a low impedance to r.f. I used 0.01's but here again

[*Continued on page 98*]

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RTTY TAPE TAKE-UP

BY E. W. KOCH,* W8QMI

One of the problems encountered with RTTY tape gear is that of reeling up and dispensing tape. Uncontrolled tape has a habit of ending up under one's foot, with subsequent damage to tape and temperament. Described are two simple systems of tape control which can be built inexpensively and which will handle tape gently and correctly.

RTTY tape take-up systems can be classified as high speed or low speed systems. The low-speed system consists of two parts, a tape dispensing turntable and a tape take-up reel. Let's look at the tape dispenser first, as shown in fig. 1. The base is the top of a one-pound coffee can with the edge trimmed to remove all traces of the sides. At the center of this is soldered a brass ball point pen cartridge (thin style) cut to 3" in length, with the ball at the top. This serves as the bearing for the turntable. The turntable is made from the bottom of the coffee can, with ½" rim left in place. A little filing will smooth up the edge of the rim. Drill or punch a smooth ¼" hole in the center of the can bottom. Make up a 3" length of wooden broom handle or 1" diameter dowel stock. Center-drill a ¼" hole to within ¼" of the top of the dowel. Cement the dowel with epoxy cement to the can bottom, carefully centering it so the hole in the dowel corresponds with the hole in the bottom of the can. Let the cement harden overnight; then assemble the unit by slipping the dowel and its turntable over the ball point cartridge.

To use the turntable, place a roll of tape in the tray with the beginning of the message at the inner center of the roll. Pull out this end of the tape and feed it to the tape distributor. One requirement is that the center opening of the reel of tape must be at least two inches in diameter to allow the tape to feed readily without binding. It is best to have the turntable at about the same height as the tape distributor; this avoids the possibility of tape looping over the top of the turntable spindle, with subsequent tangling and twisting. Another consideration is to have the turntable as close as possible to the tape distributor to prevent the formation of a long drooping loop—the turntable rotates so easily that such a loop will unreel the entire tape and deposit it on the floor in a flash.

Take-up Reel

The take-up reel mechanism will tickle the memories of readers of the RTTY column who saw the cartoon where a young RTTYer was using Mom's barbeque as a tape reel; in self-defense I can only say that I was using this system long before the cartoon was published. At any rate, the barbeque spit motor is the heart of the tape-up reel, as shown in fig. 2. Since such motors vary considerably in dimensions, no attempt will be made to guide you in that respect.

The motor should be mounted on a bracket on a wooden base so that the shaft is horizontal. Press fit to the shaft a micarta, wood, or plastic hub 1" in diameter, 1" wide. To the rear face of the hub screw a sheet metal disc approximately 6" in diameter. On the front face of the hub are two retainer screws to hold the tape hub in place. The tape hub is 1" wide and 2½" in diameter, made of wood. The rim should be tapered about three degrees and polished well so the tape will readily slide off to the outside. A slot ⅜" deep is cut in the hub to provide a convenient starting point for the tape. Two tape guides formed from coat-hanger wire are screwed to the wooden base.

In using this device, you will soon learn that the one critical consideration is the adjustment of reel slippage to provide adequate take-up of

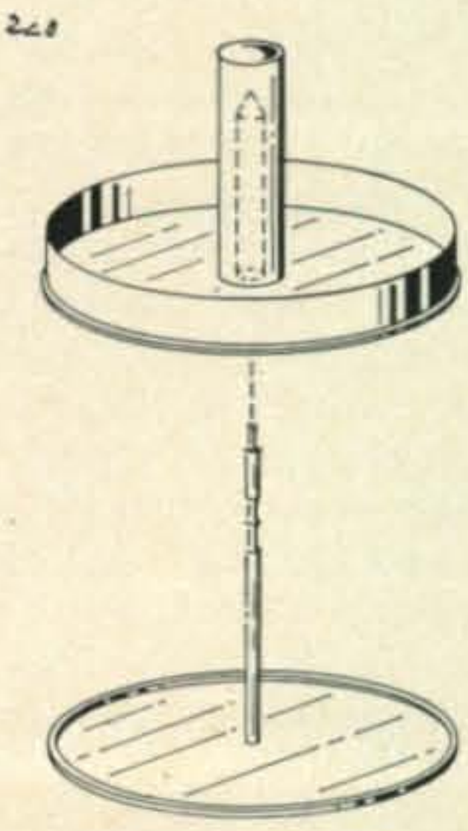


Fig. 1—RTTY tape dispenser made from a ball point pen cartridge, 1" dowel and a coffee can.

*2911 Dartmouth Drive, Midland, Michigan.

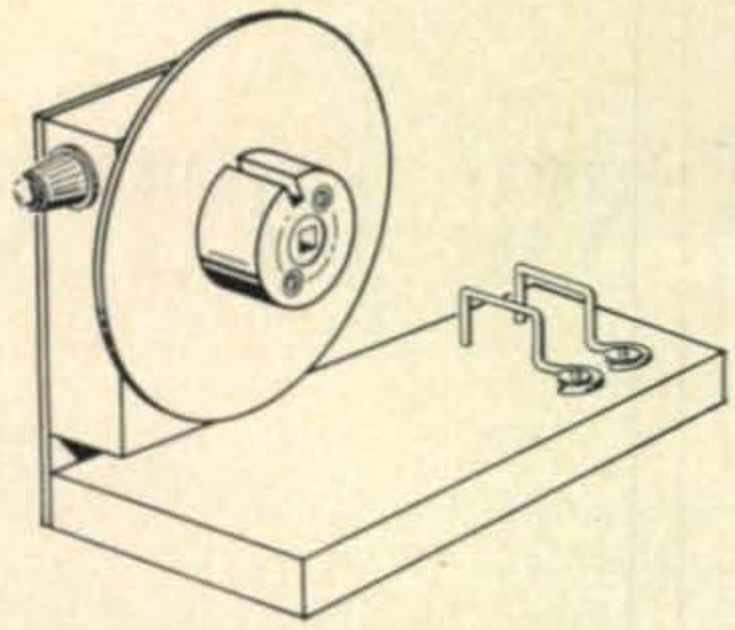


Fig. 2—A low speed RTTY tape take-up can be made using a barbecue motor. The tension brackets are made from a coat hanger.

tape without approaching the danger point where the tape can be torn as it emerges from a tape distributor or reperforator. You should experiment, using the flimsiest tape available. You will be amazed at how little tension is wanted. The reel can be adjusted for tension by smoothing or roughening the mating surfaces of the two hubs. At one time I used a light wire spring fastened under one of the retaining screws, with the end bearing up against the tape hub. If you end up with too little tension, this may save you making up another hub. When the tape is completely wound up, either turn off the motor or remove the tape. As soon as the tape clears the tape guides it will have a tendency to flop off the rotating reel, and this can create quite a mess.

High Speed Take-up

The low-speed system described has limitations mostly having to do with storage. The take-up reel necessarily exerts very little tension on the tape, hence the tape is loosely wound. Short tapes can be stored satisfactorily in this condition, but require careful handling to avoid spillage. They also take up considerable space. Long picture tapes become very unwieldy and bulky. To avoid these drawbacks, the following high-speed method of tape handling was devised. The term high-speed is used advisedly; a ten-minute tape can be rewound in less than 30 seconds!

The take-up reel is shown in fig. 3. The heart of this unit is an ac-dc universal type motor, preferably one of the governed Teletype motors stripped of the governing system. Mount the motor on a wooden base and equip it with a control switch. Assuming you are using a Teletype motor, feed it with 60 v.a.c., or preferably with a.c. from a Variac. Or, if you are really up on such things, control it with a silicon controlled-rectifier circuit. The variable speed feature is very desirable.

Make up a 1⅛" diameter, 1" wide plastic hub, with a ¼" tape-starting slot, as shown. Drill and counter bore a hole for the retainer screw to match the tapped hole in the shaft of the Teletype motor. Drill and tap two holes in the rear face of the hub; use these to bolt a 6" diameter sheet metal disc in place. Be sure to highly polish the curved surface of the hub; this facilitates removal of the roll of tape.

Your first use of this device may be disconcerting to say the least. Be sure to practice a while with a discarded tape to get the knack of it. Insert the tail end (the last of the message) in the slot, with the printed side down. This is important—it permits the reel of tape to be tightened to any desired compactness. If tape is wound in the opposite direction, the chad lids will interlock and no slippage will be possible. Use your right forefinger to guide the tape edge and use your thumb (a) to control the speed of the reel by pressing against the rotating disc, and (b) to control the tension of rewind by pressing down on the back of the tape as it winds on the reel. You must take pains to avoid kinks in the approaching tape and to avoid allowing the tape to slip off the reel during winding. Use your left hand as a tape guide and to sense the approach of tangles or kinks; when you detect such, your right thumb can put on the brake and stop the reel until the tangles are remedied.

The above technique can be used also to wind tape previously reeled up on the low-speed take-up reel. Just put the reel of tape in your lap and guide it with your left hand. Make sure the inner end of the tape is tucked in before proceeding. Note that in this case you are starting the operation with the beginning of the message at the inside of the reel and ending up with it on the outside of the reel. Note too that the reels wound on the high-speed unit are much tighter and more compact, and with a small hub diameter. This makes for better storage. The degree of tightness of wind is a matter of personal preference. If the tape is wound tightly, it will have a tendency to curl when released; if wound loosely, it will be apt to slip apart. Experience will indicate the happy medium for you.

Tape Removal

Another knack is required to remove the roll of tape from the reel. Hold the disc of the take-up reel immovable with your left hand; grasp the reel of tape with your right hand and twist it in the direction opposite to the direction of wind-up. This provides the slack necessary to allow the tape to slip off the hub.

To dispense tape wound on the high-speed reel, a simple and practical solution is the use of a cigar-box (the 25-cigar size) in which a slot is cut in one edge for the tape to emerge.

[*Continued on page 99*]

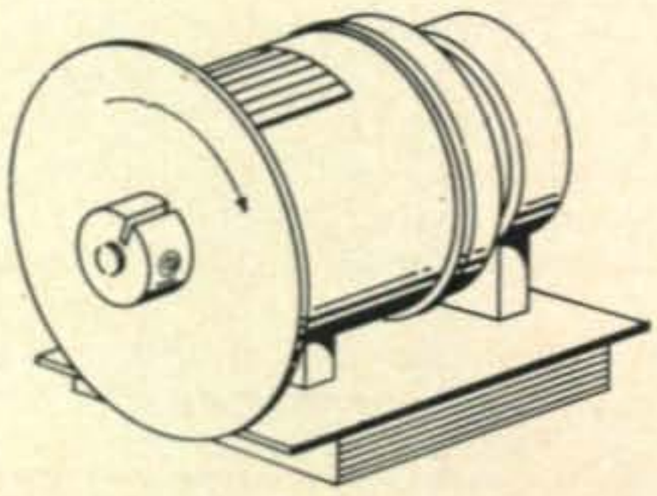


Fig. 3—This high speed RTTY tape take-up reel uses a teletype motor. The construction of the hub and plate is described in the text.

Announcing

THE *CQ* WORLD WIDE SSB CONTEST

April 16-17, 1966

I Contest Period: 1200 GMT Saturday, April 16th to 2400 GMT Sunday, April 17th, 1966. Only 24 hours out of the 36 hours permitted for Single Operator stations. The 12 hours of non-operation can be taken in two periods, at the beginning, end, or during the contest. It need not be in two equal periods, but must total a minimum of twelve hours and be clearly indicated on the log.

Multi-operator stations are not required to show a rest period and may operate the full 36 hour contest period.

II Bands and Participation: All bands 3.5, 7.0, 14.0, 21.0, and 28.0 mc can be used but operation is confined to two-way sideband emission only.

III Type of Competition: 1. Single Operator (a) All Band (b) Single Band. 2. Multi-Operator (a) All Band Only.

IV Equipment: Only one transmitter may be operated at any one time, and competitors may use the maximum power permitted under the terms of their license. (Multi-transmitter operation is *not* permitted in this contest.)

V Serial Numbers: The contest exchange will be the usual five figure serial number, RS report plus a progressive three digit contact number starting with 001 for the first contact.

VI Points: 1. Contacts between stations on different continents will count three (3) points.

2. Contacts between stations on the same continent but not in the same country will count one (1) point.

3. Contact between stations in the same country will be permitted for the purpose of obtaining a Prefix multiplier, but will have no QSO point value.

VII Multiplier: The multiplier in this contest will be determined by the number of different prefixes worked. A "prefix" is considered to be the two or three letter/numeral combination which forms the first part of an amateur station call. (W1, WA2, DJ2, DL4, GB2, 4X4, 5AI). Each different prefix may be counted only *once* during the contest.

VIII Scoring: 1. The score for a single band entry will be the total contact points on that band multiplied by the number of different prefixes worked on that band.

2. The score for an all band entry will be the total contact points from *all* bands multiplied by the total number of different prefixes worked on *all* bands.

3. A station can be worked once on each band for QSO point credit; however, prefix credit can be taken only once regardless of the band.

4. Those sending in a log for a single band will be eligible for a single band award only. If a log shows more than one band, it will be judged as an all band entry unless indicated otherwise.

5. A station will not be eligible for more than one award.

IX Awards: Certificates will be awarded to the highest scoring Single Operator station in each country and each call area of the United States, Canada, and Australia.

1. For the highest score on each Single band.

2. And for the highest score on all bands.

Certificates will also be awarded to the highest scoring Multi-Operator station in the same areas but for All band scores only. (Alaska and Hawaii will be considered as separate countries for both scoring and award purposes.)

X Disqualification: Violation of the rules and regulations pertaining to amateur radio in the country of the contestant, or the rules of this contest, or unsportmanship conduct, will be deemed sufficient cause for disqualification.

XI Log Instructions: 1. Indicate a prefix only the first time it is contacted.

2. Use a separate sheet for each band and also a tally sheet or report form.

3. All times indicated must be in GMT. And the 12 hour rest period must be clearly indicated.

4. All contestants are expected to compute their own scores. Logs should be checked for contact and prefix duplication and proper point credit before they are submitted. Unscored logs will be used as check logs only.

5. A prefix check list is not only desirable but a *must* for proper contest operation.

6. Make sure name and address is clearly shown on each summary sheet. *PRINT or TYPE.*

7. Each contestant must sign a pledge that all rules and regulations have been observed and that the report is a true one.

8. Official log forms are available from *CQ*. Send a large-size, self-addressed envelope with sufficient postage to cover your request. If official forms are not available use a duplicate form. The size is 8½ x 11" with 40 contacts to the page. (The same forms used in our World-Wide DX contest can be used.)

9. It is suggested that you send your prefix check-off list along with your log.

XII DEADLINE: All logs must be postmarked *no later* than May 15, 1966. Send logs to: *CQ*, 14 Vanderventer Avenue, Port Washington, New York 11050. Attention: WW SSB Contest.

CQ WORLD-WIDE SSB CONTEST

Gottlieb Stalder — CALL HB9ET

Tellrohof, Meggen, LU, Switzerland — BAND 14 mc

GMT	STATION	SERIAL NUMBER SENT	SERIAL NUMBER RECEIVED	PREFIX	Points
01	VS9MB	57001	57001	VS9	3
	4X4IK	58002	58003	4X4	3
	DM3PB	57003	57002	DM3	3
05	4Z4BY	58004	58003		3
10	W2GAZ	56005	56004	W2G	3
	9Q5AE	56006	56004	-	3
	DD1MF	56007	57005	DD1	3
	5A1TW	58008	59007	5A1	3
40	5A1TW	58009	59007	5A1	3
50	W1DBE	59010	59009	W1	3
00	W1DTE	58011	58001		3
	K2MFE	59012	59009	K2	3
	K2IEG	59013	58009		3
	W2WCE	59014	59015	W2	3
	VA2OZO	58015	57009	VA2	3
	WB2OOO	57016	57010	WB2	3
	VP2VJ/VP2V	56017	56008	VP2	3
	DA2F	59018	59015	DA	1
	G3KMR	59019	59015	G3	1
	OE1RZ	57020	57013	OE1	1
	ZT1A1	56021	56012	ZT1	1
	CM2[illegible]	57022	57014	CM2	1
	OH2YZ/MM	56023	57010		1
	K2LIPU	59024	59012	K2LI	0
	K3PUD	59025	59015	K3PU	0
				TOTAL THIS PAGE	20 / 57

CQ WORLD-WIDE SSB CONTEST

Robert W. Stanhope — CALL W2WCE

[illegible] Pitcairn Ave., Hohokus, N.J. — BAND 14 mc

GMT	STATION	SERIAL NUMBER SENT	SERIAL NUMBER RECEIVED	PREFIX	Points
01	JA5IW	55001	56001	JA5	3
	JA1BWA	55002	56002	JA1	3
10	DW9DC	55103	56002	DW9	3
15	UA9PE	55004	56001	UA9	3
40	UL7LL	56005	56009	UL7	3
05	DJ7JL	57006	56008	DJ7	3
10	DJ5EW	57007	56007		3
15	SM5BCA	56008	56007	SM5	3
20	UL7BA	55009	56005	UL7	3
25	G3RRP	57010	57009	G3	3
30	G3PZR	57011	57008		3
35	UB5WP	56012	56009	UB5	3
40	UT5AA	56013	56008	UT5	3
00	CM8JU	57014	57010	CM8	3
05	WB6AUI/CM8	57015	57011		3
10	DJ1BG/M1	56016	57009	M1	3
15	RB9ZT	57017	56012	RB9	3
20	4O1ITU	57018	58010	4O1	3
30	WJ2R/VP9	58019	59015	VP9	3
35	VP9BO	58020	59015		3
40	RP1AO	56021	57009	RP1	3
45	KS5JC	57022	58013	KS5	3
50	KJ2UB	55023	55015	KJ2	3
55	EI2JBO	56024	56012	EI2	3
00	KL7JBO	55025	55015	KL7	3
				TOTAL THIS PAGE	21

1965 CQ W.W. SSB DX Contest Results

BY ROBERT W. STANKUS,* W2VCZ

If one had to make a guess as to which Phone DX Contest enjoys the biggest growth in activity, I'm afraid to say this one would win hands down. This contest enjoyed its biggest gain in 1965 by drawing more than 300 logs, and that alone is the reason for this article being late. The cross checking proved to be a tedious task and with some of the logs not showing the proper scoring, your author got snowed under.

I must emphasize that in the future, all participants should study the rules, particularly the scoring section. This will save considerable time by having a completed entry.

As for the winner, well, it's another triumph for DL3LL who comes through once again for the 3rd year in a row. Harry's very fine setup plus tremendous contest savvy piled up a quarter million point advantage over his nearest rival OD5BZ. 9M4LP, Bob Snyder came in third, while K2HLB, piloted this time by Don Miller, roared into fourth position.

In the single operator-single band category, SM5BLA came up with a very outstanding score on 20 meters . . . 672,434 points with 301 prefixes as the multiplier; Truly a very fine effort and a tip of the ole hat to Sigge. 9M4LX with 539,010 and 5A1TT with 399,312 followed in that order.

Taking a look at the Multi-Op boys, we find I1RB at the top with 854,832 points. Congratulations, Paul. M1ZG, a nearby neighbor of I1RB, came through with 736,890 points.

Looking over the other single band entries, one must single out GI3CDF who worked 80 meters and produced a fantastic score for that band—24,900 points. Les' fine knowledge of the band and outstanding signal rewarded him with a nice score. On 40 meters, G3NLY produced a point total of 9,702 to lead the parade on that band. 4X4TP came up with a beautiful effort on 15 as he led the contingent with 110,580 points. The 10 meter band failed to produce any really outstanding scores, but HC1EW took honors with 3,875 points.

I am still getting comments regarding the 12 hour rest period. Judging from the single band entries on 20 meters, it seems that if there isn't a rule change soon it will be 20-meters-only for a lot of us. Generally, 40 and 80 showed very little activity. I shall do my best to convince the Contest Committee that the break period should be eliminated entirely, so we might get back on the low frequencies, and it would be a good idea if you'd make the Editor aware of your feelings, too.

In closing, I'd like to thank each and everyone of you for making this contest a success and to those who submitted check logs . . . thanks a million.

This year's affair will fall on the weekend after Easter, April 16 and 17, with the rules remaining the same. I'd like to say that I would appreciate having a completely totaled entry. Countries do not count, we are chasing prefixes coupled with points derived from QSO's.

Much appreciation goes to my wife Monya, who labored at the typewriter and logs for these many days, and now realizes that ham radio is work after all.

73, Bob, W2VCZ

*5 Pinetree Road, Ramsey, New Jersey.

YV1LA digging for a new prefix.

SINGLE OPERATOR

North America

United States

K1HVV	....	**A**	**740**	**148**	**109,520**
W1FZ	.....	A	373	86	32,078
W1ZFV	....	**14**	**746**	**149**	**111,154**
W1BUS	..	14	193	69	13,317
W1MRQ	..	14	140	79	11,060
K1IIK	....	14	185	47	8,695
K2HLB	....	**A**	**1441**	**224**	**322,784**
WA2SFP		A	1100	212	233,200
W2IUV	..	A	131	49	6,419
W2GKZ	..	A	139	36	5,004
WB2MFX		**14**	**742**	**141**	**104,622**
K2DGI	....	14	432	106	45,792
W3GRF	..	**A**	**1264**	**203**	**256,592**
K3BNS	..	A	317	91	28,847
W3JNN	..	**14**	**1271**	**197**	**250,387**
WA3COJ		14	500	125	62,500
K3QVV	..	14	297	76	22,572
K4CGC	....	**A**	**630**	**139**	**87,570**
WA4IVL		A	484	122	59,048
K4ARO	....	A	123	33	4,059
W4BVV	..	**14**	**1249**	**197**	**246,053**
W4HZI	..	14	762	157	119,634
K4WHD	..	14	733	157	115,081
K4ZBW	..	14	428	101	43,228
W4OMW		14	149	45	6,705
W4RLS	..	**21**	**303**	**79**	**23,937**
W4HKJ		21	197	73	14,381
WA4SUR		**28**	**56**	**40**	**2,240**
W5WBU	..	**A**	**106**	**29**	**3,074**
WA5ALB		**7**	**18**	**22**	**396**
W5AJY	....	**14**	**207**	**92**	**19,044**
K5MDX	..	14	208	71	14,728
W5LGG	..	**21**	**351**	**104**	**36,504**
K6TSY	....	**A**	**752**	**169**	**127,088**
W6YMV	..	A	208	75	15,600
K6AHV	....	**7**	**92**	**40**	**4,048**
K6EVR	....	**14**	**710**	**154**	**109,340**
WA6OHJ		14	192	99	19,008
W6RKP		14	369	127	46,863
W6NAT		14	109	36	3,924
K6CT	....	**28**	**29**	**15**	**435**
W7ESK	..	**14**	**963**	**176**	**169,488**
K1GXU/7		14	329	113	37,177
K7VAL	...	14	204	61	12,444
W7LBN		14	150	59	8,850
W8CLR	..	**A**	**448**	**123**	**55,104**
WA8CZH		A	341	108	36,828
K8OVK	....	**14**	**318**	**73**	**23,214**
WA8DXW		14	149	49	7,301
WA9HJM		**A**	**81**	**39**	**3,159**
W9UZC	..	**14**	**421**	**114**	**47,994**
W9WKU		14	312	79	24,648
K9BTU	....	14	225	80	18,000
W9EGQ		14	137	41	5,617
W9OKM		**21**	**104**	**34**	**3,536**
WØLBB	..	**A**	**205**	**74**	**15,170**
WØKZZ	..	A	74	43	3,182
WØNFA	..	**14**	**254**	**77**	**19,558**
WAØBVV		14	143	70	10,010
WØEQN		14	112	44	4,928
WØGNX		14	93	36	3,348
WØLBS		21	193	48	7,344

Canada

VE1TG	..	**14**	**589**	**120**	**70,680**
VE2BV	..	**14**	**471**	**124**	**58,404**
VE2UQ	..	14	284	78	22,152
VE2AFC	..	14	108	36	3,888
VE3ES	..	**14**	**492**	**119**	**58,548**
VE3AIR	..	14	472	117	45,224
VE4XO	....	**14**	**481**	**133**	**63,973**
VE4SC	....	14	220	77	16,940
VE6TP	....	**14**	**392**	**123**	**48,216**
VE6BR	..	14	399	111	44,289
VE7PV	..	**14**	**803**	**172**	**138,116**
VE7BDW		14	130	41	5,330
VE8AH	..	**A**	**452**	**131**	**59,212**
VE8RG	..	**14**	**1139**	**200**	**227,800**
VO1FB	..	**14**	**325**	**83**	**26,975**

Alaska

KL7EOJ	..	**14**	**375**	**72**	**27,000**

Hawaii

KH6IJ	....	**A**	**2098**	**87**	**182,526**

Bahamas

VP7CC	....	**14**	**301**	**77**	**23,177**

Bermuda

VP9EK	....	**14**	**711**	**136**	**96,696**

Greenland

OX3KM	..	**14**	**414**	**100**	**41,400**

Grenada

VP2GTA	..	**14**	**525**	**120**	**63,000**

Mexico

XE1AB	A	1204	165	198,660

Panama

HP1JC	A	234	72	16,848

Puerto Rico

KP4RK	21	256	61	15,616

Africa

Ascension Island

ZD8HL	A	1185	131	155,235

Congo

9Q5AA	A	820	147	120,540
9Q5TJ	21	98	34	3,332

Libya

5A3TX	A	439	89	39,071
5A1TT	14	2256	177	399,312

Morocco

CN8AW	14	774	114	88,236

Rhodesia

ZE1AC	A	1012	137	138,644

Somalia

606BW	A	1728	157	271,296

Uganda

5X5IU	A	1362	171	232,902

Asia

Christmas Island

VK9DR	A	75	23	1,725

Iran

EP2AU	14	1441	164	236,324

Israel

4X4HW	14	2136	163	348,168
4X4TP	21	970	114	110,580

Japan

JA1BK	A	1224	443	175,032
JA6GT	A	239	49	11,711
JA2AHT	A	120	25	3,000
JA1CG	14	1006	100	100,600
JA1ADN	14	450	90	40,500
JA1YL	14	168	70	5,544
JA7AD	14	116	35	4,060
JA4BJO	14	80	25	2,000
JA3COX	21	200	49	9,800
JA1MYR	21	162	29	4,698
JA3AYL	21	126	28	3,428
JA1DXE	21	78	22	1,714

Lebanon

OD5BZ	A	2216	185	409,960

Malaysia

9M4LP	A	2120	191	404,920
9M4LX	14	2385	226	539,010

Asiatic U.S.S.R.

UA9FB	14	210	60	12,600
UA9HA	14	68	26	1,768
UW9AF	21	238	45	10,710

Azerbaijan

UD6BR	A	562	117	65,754
UD6GF	A	309	59	18,231

Kazakh

UL7FA	14	819	129	105,651

Kirghiz

UM8KAB	14	174	56	9,744

Tadzhik

UJ8KAA	A	736	122	89,792

Europe

Austria

OE2EGL	A	1236	121	149,556
OE2UE	A	105	36	3,780
OE1IU	14	175	56	9,800

Belgium

ON4AD	21	101	35	3,535

Czechoslovakia

OK2KBR	A	798	138	110,124
OK3CDR	A	456	123	56,088
OK1VK	A	675	73	49,275
OK1ADM	A	349	117	40,833
OK1AHV	A	225	81	18,225
OK2BDB	A	260	136	16,900
OK2ABU	A	149	69	10,281
OK2BCY	A	66	49	3,234
OK1VE	3.8	85	53	4,505
OK1FV	3.8	70	44	3,080
OK1AAE	3.8	68	43	2,924
OK1AHZ	3.8	46	34	1,394
OK2CWG	14	501	83	41,583
OK3EA	14	305	79	24,104
OK1JX	14	116	38	4,408
OK2BEN	14	110	35	3,850
OK1NL	14	44	30	1,320
OK1MP	21	37	14	518

Denmark

OZ3SK	A	472	118	55,696
OZ3KE	3.8	36	24	864
OZ4RT	14	280	94	26,320
OZ1FO	14	167	48	8,016
OZ3OY	14	85	29	2,465
OZ5GJ	14	44	21	924

England

G4CP	A	1580	186	293,880
G8KS	A	825	162	133,650
G3NLY	7	154	63	9,702
G5HZ	7	105	61	6,405
G3PCG	14	1676	138	231,288
G3IEN	14	1513	110	166,430
G2ABB	14	741	143	105,963
G3OOB	14	814	59	48,026
G2QT	14	490	96	47,130

Finland

OH2MK	A	343	95	32,585
OH2DX	14	1644	154	253,176
OH5TM	14	572	123	70,356
OH1VT	14	748	61	45,628
OH1OE	14	224	75	16,800
OH2BQ	14	196	73	14,308
OH7PI	14	259	41	10,619
OH2XA	14	110	42	4,620
OH2FS	14	64	32	2,048

France

F8PI	A	992	181	179,552
F9MS	A	726	180	130,680

Germany

DL3LL	A	3496	198	692,208
DL9PU	A	502	120	60,240
DL8DX	A	378	141	53,298
DL7EN	A	401	121	48,521
DJ9BM	A	547	102	55,794
DL4UN	A	459	64	29,376
DJ4ZBA	A	313	79	24,727
DM3ML	A	314	56	17,584
DL1AM	A	205	77	15,785
DL9MC	A	180	76	13,680
DJ1UE	A	159	66	10,494
DL9EM	A	136	62	8,432
DJ2SR	A	140	59	8,260
DJ9EB	3.8	44	33	1,452
DJ1LP	14	1525	156	237,900
DL1UR	14	1393	139	193,627
DL5AO	14	1495	123	183,885
DJ3GI	14	764	125	95,500
DJ7VY	14	523	132	69,036
DJ1SX	14	556	113	62,828
DL7EM	14	148	57	8,426
DJ5HIV	14	128	35	4,480
DJØLW	14	86	48	4,128
DJ1QP	21	150	48	7,200

Greece

SVØWPP	A	1006	172	173,032
SVØWBB	14	996	156	150,696

Iceland

TF3EA	14	110	60	6,600

Ireland

EI7M	A	453	88	39,864

Italy

IT1TAI	A	687	176	120,992
I1CWN	21	224	66	14,784

Luxembourg

LX1DB	A	355	108	38,340

Netherlands

PAØHBO	A	1340	201	269,340
PAØGMU	14	338	91	30,758
PAØLOU	21	88	34	2,992

Unusual call sign that caused all the rumpus.

OE2EGL during a lull period.

N. Ireland

GI3CDF	3.8	249	100	24,900

Norway

LA1EE	A	684	154	105,336
LA7VE	14	635	111	70,485
LA1NG	14	486	105	51,030
LA7RE	14	204	41	8,364
LA4AF	14	91	32	2,912

Portugal

CT1PK	21	286	55	15,785

Roumania

YO3LM	A	544	112	60,928
YO3JU	14	232	83	19,256
YO3ZA	14	237	80	18,960
YO3ZM	14	105	52	5,460

Scotland

GM3NQB	3.8	115	61	7,015
GM3JDR	14	433	91	39,403

Sweden

SM5FE	A	1361	149	202,889
SM5CHH	A	121	40	5,120
SM7CRW	3.8	108	57	6,156
SM5BLA	14	2234	301	672,434
SM4SB	14	1398	175	244,650
SM6CKV	14	1417	156	221,052
SM7BKZ	14	1005	144	144,720
SM6BCG	14	697	94	65,518
SM5KV	14	357	113	40,341
SM5OV	14	338	90	30,420
SM1CXE	14	202	54	10,908
SM5AJU	14	141	62	8,742

Switzerland

HB9ZY	A	1518	166	251,988
HB9UD	A	132	60	7,920
HB9AAF	14	127	43	5,461

U.S.S.R.

UW3BV	14	1243	140	174,020
UV3TP	14	1073	148	158,804
UA4KED	14	981	156	153,036
UA3DR	14	478	108	51,624
UA1IG	14	528	92	48,576
UA4SS	14	196	75	14,700
UA1ZF	14	185	55	10,175
UA4CZ	14	141	40	5,640
UA3FT	14	65	31	2,015

Estonia

UR2GZ	A	77	32	2,464

Karelo Fin. Rep.

UN1BK	14	645	96	61,920

Ukraine

UB5UN	A	1158	195	225,810
UB5WJ	3.8	36	24	864
UB5WF	14	2057	149	306,493
UB5OD	14	276	78	21,528

White Russia

UC2KMZ	14	351	61	21,411

Wales

GM3NWV	3.8	58	38	2,204

Oceania

VKØGW	14	318	43	13,674

Australia

VK3ATN	A	1256	150	188,400
VK2NN	A	707	110	77,770
VK6RU	A	373	68	25,364
VK2APK	14	309	66	20,394
VK5GG	14	129	37	4,773
VK4SD	14	84	23	1,932
VK3SM	21	104	18	1,872

Guam

KG6APJ	14	589	57	33,573

Philippines

DU1LM	14	654	90	58,860

New Zealand

ZL1AGO	A	672	66	44,352

South America

Argentina

LU7DGM	A	1200	92	110,400

Brazil

PY2CQ	14	1269	124	157,356
PY3AHJ	14	901	122	109,922
PY7GV	21	400	94	37,600
PY2CMS	21	250	39	9,750

British Guiana

VP3HAG	A	1218	162	197,316

Chile

CE6EW	14	125	57	7,125

Columbia

5J4RCA	A	1494	112	167,328
HC1EW	28	149	26	3,875

Paraguay

ZP5KT	A	1269	131	166,239
ZP9AY	A	207	41	8,487

Peru

OA4KY	A	1195	138	164,910
OA4PQ	14	172	63	10,936

Surinam

PZ1BW	14	1110	131	145,410

Venezuela

YV5BTS	A	325	121	39,325
YV1LA	14	1267	130	164,710
YV5CEY	14	956	117	111,852
YV3LD	14	660	115	75,900
YV5BUW	14	601	108	64,908
YV5BIG	14	458	96	43,968

MULTI OPERATOR

U.S.A.

W3ZKH	947	182	172,354
WA6SBO	780	165	128,700
K5FFR	297	79	23,463
W8GS	265	85	22,525
W2SZ	173	50	8,650

Alaska

KL7WAH	789	115	90,735

Azerbaijan

UD6KAR	959	142	136,178

Christmas Island

VK9XI	120	40	4,800

Columbia

CX3BH	1483	154	228,382

Finland

OH2AM	1598	200	319,600

Germany

DL8CH	895	138	123,510
DLØIB	744	123	91,512
DL5JX	517	83	42,911

Great Britain

GB3RAF	2489	231	574,959
G3SSO	1573	165	259,545
G3SPY	329	127	42,783
G3SVJ/P	336	84	28,224

Italy

I1RB	3238	264	854,832
I1AT	242	73	105,270
I-LCP	726	145	17,566

ITU

4U1ITU	1579	147	232,113

Japan

KA2RG	1711	137	234,407

Luxembourg

DJ6QT/LX	2027	151	306,077

San Marino

M1ZG	3045	242	736,890

Sierra Leone

9L1JR	496	73	36,208

Sweden

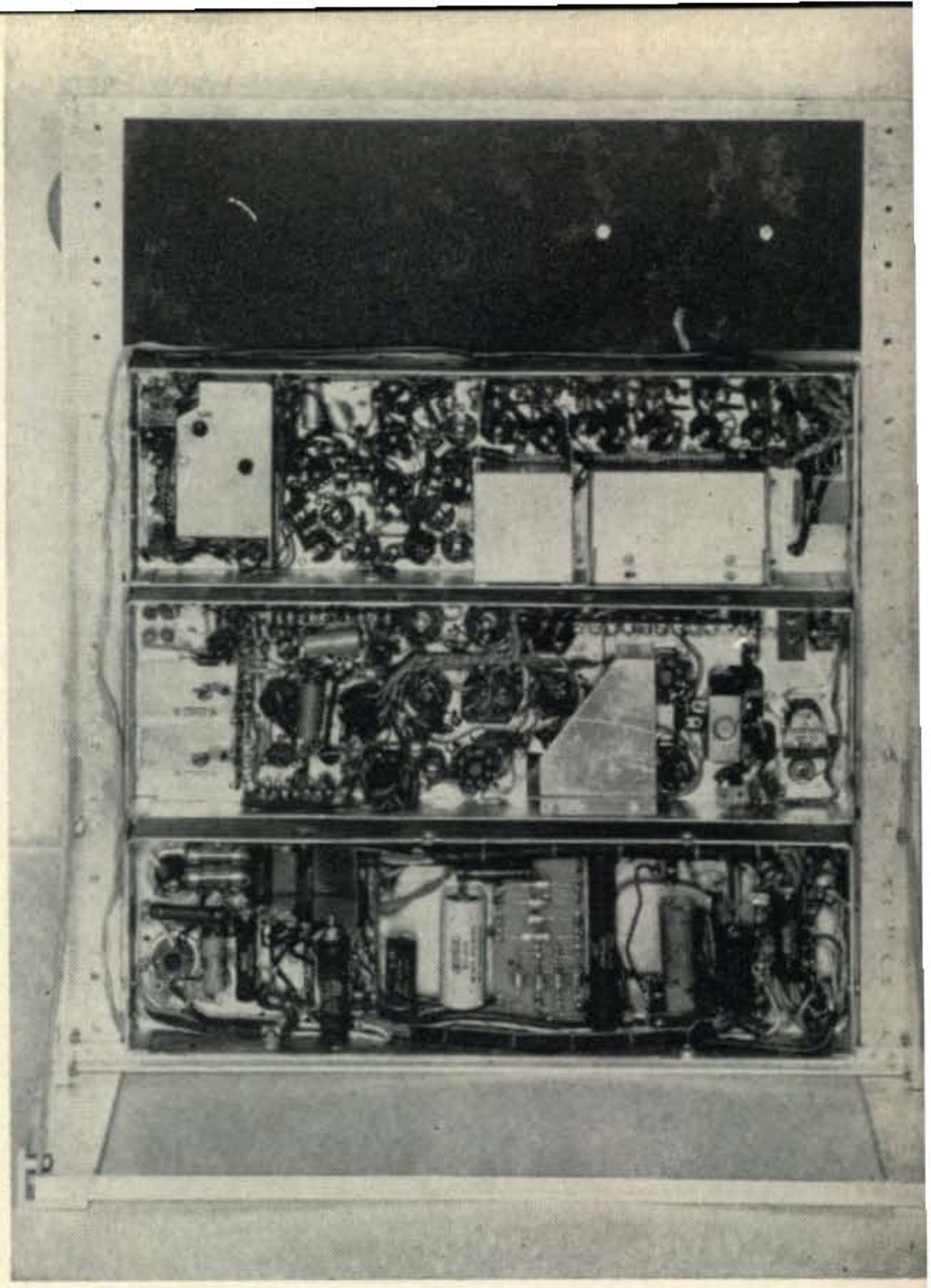
SM2BJI	1382	189	261,198
SL7ZJ	208	70	14,560

U.S.S.R.

UA1KAC	897	133	119,301
UA4CE	265	85	22,525
UA3KQF	245	65	15,925

Venezuela

YV5AKP	3154	196	618,184



Rear view of the rack-mounted Motorola FMTRU-80D. From top to bottom: blank panel for speaker on front; sensicon receiver, shield covers on 1st oscillator/chain and 2nd oscillator compartments; 30-watt transmitter, shield over final grid lines; and, a.c. power supply. Note added octal socket in left hand corner, and silicon diode rectifiers mounted on bakelite board near center of power supply chassis.

Putting the Motorola FMTRU-80D On 2 Meter F.M.

Part II

BY BYRON KRETZMAN,* W2JTP

Part I of this article, in a previous issue, reviewed the basic standards of amateur f.m. operation, described the various versions of the —80D, and covered the actual modifications to the —80D transmitter and receiver required to put this set into operation on 2 meters. In this part we will detail the construction of an a.c. power supply to power both transmitter and receiver.

As you already know, if you read Part I, the -80D mobile set comes in three bolted-together chassis; the transmitter, the receiver, and the power supply. If you stripped the d.c. power supply as suggested, you are then ready to build yourself an a.c. supply on that chassis, with a good portion of the control and test wiring from the original supply in place and usable. In addition, already in place and also usable, there is the filter choke and the filter capacitor of the receiver power supply. It is also quite likely that you will be able to use one or both of those big wire-wound resistors under the chassis, depending upon the particular transformers you find. Of course, the multi-contact control relay on the top of the chassis will also be utilized as the heart of the press-to-talk system.

Transformers

The method of approach in the design of the power supply depends upon the particular power transformers that you are able to scrounge. The most likely candidates are power transformers from discarded TV sets. You will need two such transformers, one for the transmitter and one for the receiver. These come in a wide variety of voltages, as you might expect. If you have any kind of a choice, pick those with the biggest iron cores on the very rough assumption that the bigger the core the greater the current capacity. Most transformers will have two 6 volt windings, one perhaps of thinner wire than the other. In addition there will be at least one, maybe two, 5 volt windings.

Identification of the transformer leads is accomplished with a volt-ohmmeter. First of all find the primary. Its leads are probably black, and the winding will measure around 1 to 2 ohms. The high voltage leads, most likely red, might measure 15 to 30 ohms to the center tap. Once you are sure that you have identified the primary, temporarily hook it up to the 115 volt line. *But be careful!* Those high voltage leads can give you an extremely nasty, deep, infectious burn. Now, measure the various voltages and tag or note the leads. The no-load filament voltages will be slightly high, like 5.5 and 6.5 to 7 volts. If you have two 6 volt windings, parallel them. To phase them correctly, touch them to each other (with the primary connected

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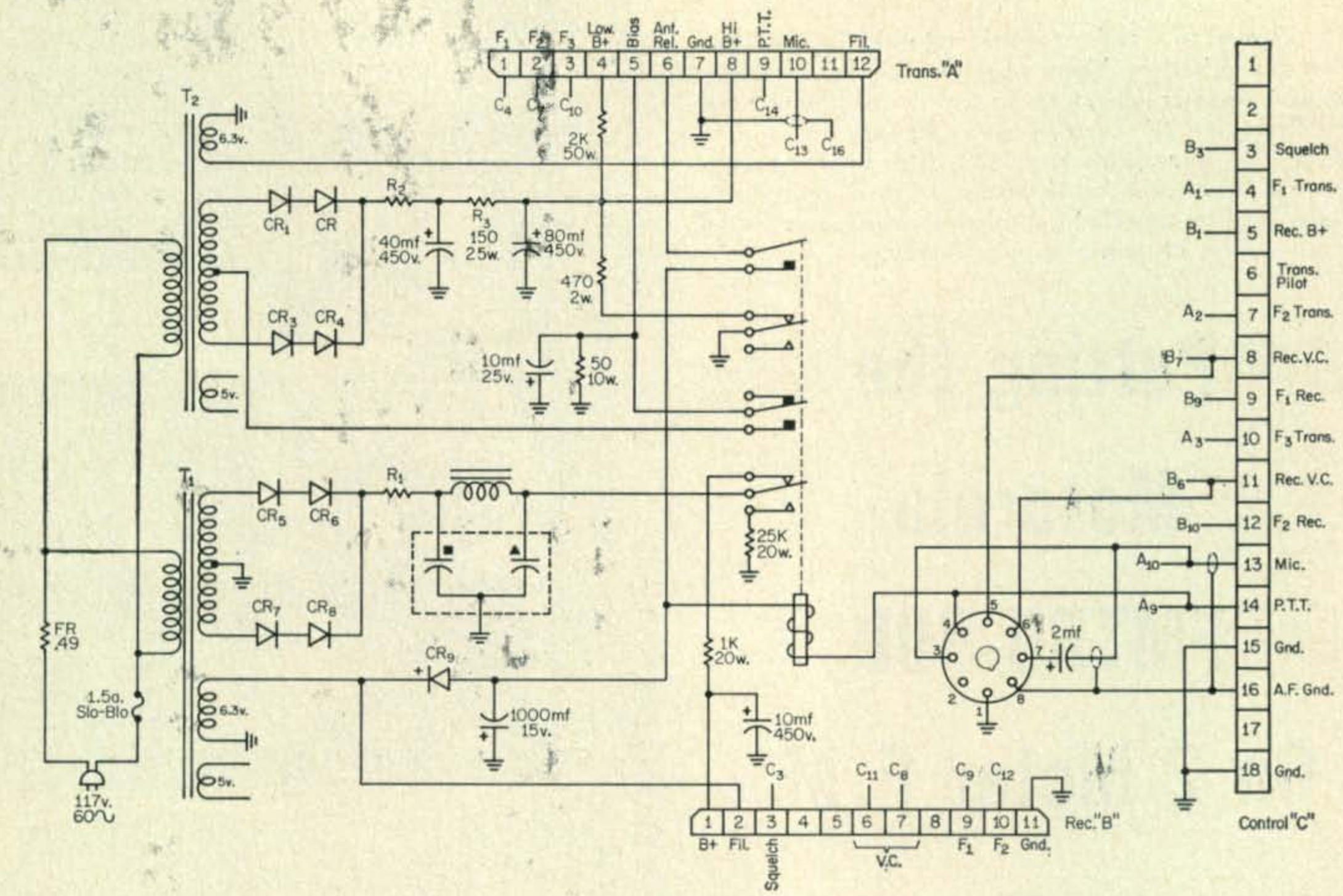


Fig. 6—The power supply circuit shown above uses the Western Electric's "highway" system described in the text. Also described in the text are the new components used.

to the line). If they spark, you are 180 degrees out of phase, so reverse *one* pair. The unloaded high voltage, to the center tap, should be about 375 to 420 for the transmitter transformer, and 175 to 250 for the receiver transformer. We will explain later just how to adjust the d.c. output high voltage.

The Schematic

Figure 6 is the schematic and wiring diagram for our a.c. power supply. We have simplified this diagram considerably by using a form of Western Electric's system of "highway" wiring diagrams. In this system each component, terminal block, and connector is arbitrarily assigned a letter. (In our diagram the transmitter plug is *A*, the receiver plug is *B*, and the control socket is *C*.) Each terminal has a number so we can indicate the destination of a wire by that number and the letter of the component to which it goes. For example, the receiver frequency F_2 switch wire at terminal 10 on the receiver plug *B* is marked C12, indicating that it goes to terminal *12* on the control socket *C*. It therefore follows that the same wire, on terminal 12 of *C*, is marked *B10*. So all of the wiring on fig. 6 shown in this manner is *original* Motorola wiring which is left undisturbed. The wiring that we added is shown in the conventional manner.

The Circuit

The circuit of our power supply, if we ignore the cabling already in, is really quite simple. The receiver power supply uses a full-wave rectifier, with 400 volt p.i.v. silicon diodes, and the filter choke and capacitor from the original vibrator supply. The value of the series resistor R_1, which could be of the slider-type, is adjusted so that the receiver has applied to it the correct plate voltage, either 180 or 200 volts. (See Part I). Note that certain contacts on the press-to-talk relay remove the receiver plate voltage when you transmit. The 6 volt winding of this transformer is used to operate the tube heaters (filaments) in the receiver.

Transformer T_2 is the plate and filament transformer for the transmitter supply. This supply also has a full-wave rectifier, but with 750-volt p.i.v. diodes. No filter choke is necessary. If the transformer voltage is a bit on the low side, giving you less than 350 volts d.c. under load, reduce R_2 to no lower than 10 ohms. If you still can't get enough voltage, either replace the transformer or be satisfied with less output from the transmitter.

Bias for the transmitter final can be obtained from either of two suggested circuit arrangements. About —13 to —15 volts is required. If you have a goodly amount of voltage out of your transformer, the simplest thing to do is to return the center-tap to ground through the 50 ohm, 10 watt, resistor under the chassis. See fig. 7(A). Just be sure to bypass the resistor with a 10 to 25 mf, 25 to 50 volt, tubular electrolytic capacitor. (Note that the plus lead of the capacitor is grounded.)

The other way to get bias is to use the low voltage relay supply. As you can see from fig. 7(B), one of those 5 volt windings can be series-connected with the 6 volt winding, or another 5 volt winding, to provide about 13 to 15 volts, and then using a 10 to 15 ohm, 5 or 10 watt,

resistor to drop this to about 5 to 7 volts for operation of the press-to-talk relay and the antenna relay. It is recommended that you make a test set-up to adjust these voltages. Just be sure to disconnect, and *insulate*, the high voltage leads while you are doing this.

Note, on the schematic of the power supply (fig. 6), the resistor marked "FR.49" that is in series with one primary lead to the transformers. This is actually a "Thermister," made by *Workman* for TV sets. It has a cold resistance of about 90 ohms and a hot resistance of about 0.49 ohms. This little device will greatly extend the life of all the tubes in the -80D as it limits the high initial "starting" current when the cold set is first turned on.

Transmitter Tune-up

The transmitter tune-up is very easy. A dummy load should be connected; Motorola recommends a 50 watt 32 volt lamp. A 32 candle power 12 volt automobile bulb works well, too. It is suggested that you clean the antenna relay contacts before you begin. If you haven't built the Test Set recommended in Part I, use a v.t.v.m. *Remember that there is high voltage on pins 7 and 8 of the metering socket.*

First of all, put the TUNE-OPERATE switch S_1 in the LO position. With the negative lead of the meter in pin 3, tune L_1 and L_2 of T_1 for maximum grid voltage on the 7C5 tripler, V_3. Since the tuning of one affects the other, go back and forth between L_1 and L_2 until you get a maximum reading. Next, switch the lead to pin 4 and tune L_3 and L_4 of T_2 for maximum grid voltage on the 7C5 doubler, V_4. Follow the same procedure at pin 5, tuning L_5 and L_6 for maximum. With the test lead in pin 6, tune the 2E26 driver tank capacitor C_{18} for maximum grid voltage on the final. Then tune the separate grid capacitors for maximum grid voltage. Use a long insulated screw driver.

If you haven't built the test set mentioned before, connect a 0-to-100 ma meter between pins 7 and 8 on the metering socket. You can then measure the plate current to *either* 2E26 final, depending upon the position of the BALANCING switch on the side of the p.a. cage. With power off, take off the p.a. cage cover and set the plate lines shorting bar about ½-inch from the bottom of its travel; and, loosen the lock nut on the disc-type tank capacitor at the plate end of the lines. The hairpin antenna coupling loop should be set about half-way; about 15 degrees from the plate lines. Now, with the TUNE-OPERATE switch still in the LO position, turn on the power and, with an insulated tuning tool, tune the disc capacitor for a dip in plate current. The dummy load should glow dull red. (The output is about 10 watts.) Retrim the driver tank and the grid capacitors of the final for maximum p.a. grid voltage (pin 6). The output coupling link is resonated by tuning the series variable capacitor (C_{27}) provided for maximum output. Turn off the set and lock up the disc tank capacitor, being careful not to

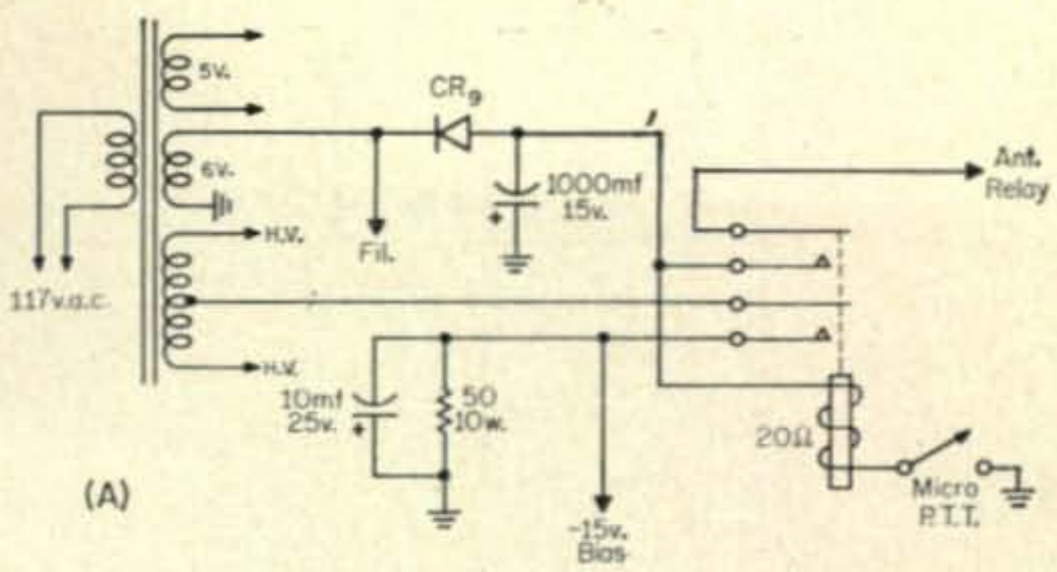


Fig. 7—Two alternate circuits that may be used to provide bias for the transmitter section of the -80D.

change its setting. At this point you can put the p.a. cage cover back on. (If you leave it off, slightly more power output can be realized.)

Flip the TUNE-OPERATE switch into HI and check the p.a. plate current. It should be less than 50 ma. Re-dip the p.a. tank, this time using the movable shorting bar adjustment. Check the plate current balance between the two tubes by flipping the BALANCE switch from one position to the other. If there is more than about 5 ma difference, adjust the separate p.a. grid capacitors until a reasonable balance is achieved. Make sure that you don't lose too much grid voltage in the process as r.f. output will drop off if you do. The final can now be loaded up by moving in the coupling loop a little bit at a time. Each time you move it in, recheck the p.a. and the antenna trimmer for maximum output. The maximum loading per tube should be 80 ma. If you operate the -80D transmitter in repeater service or on RTTY, where there will be long periods of transmission, it is suggested that you lighten the loading to about 60 ma. This will reduce output to about 20 to 25 watts but the 2E26 tubes in the final will last a lot longer.

Just as a reminder, maximum output of the p.a. does not always occur at minimum dip of the plate current, so it is recommended that you use either a remote field strength meter, with the indicator near the transmitter, or an in-line v.s.w.r. and output (relative) indicator such as the Allied P-2 to insure peak performance.

Receiver Tune-up

Unless you have a *very* accurate source, say a crystal oscillator, at 455 kc (or 457 kc), do not touch either the primary or the secondary of the discriminator. Unless there is evidence to the contrary, assume that this part of the tune-up is correct. Figure 5(A), with Part I of this article,

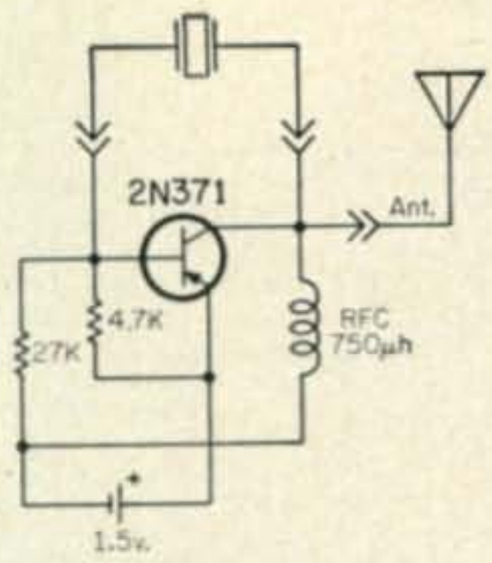


Fig. 8—Circuit of the W6TNS test oscillator used to provide a signal to align the receiver.

shows the chassis layout of one version of the sensicon receiver. Other versions will be similar, but if you do have another version it is suggested that you make a chassis layout drawing, and by this process identify each i.f. and r.f. can (or pipe). Start tracing at the antenna connector, and you will find everything falling into logical place.

You really don't need elaborate equipment to line up the first and second i.f. amplifiers. (We use a Heathkit IG-102 Signal Generator.) With no crystal plugged in the front-end, feed in the unmodulated 455 kc (or 457 kc) by putting the output lead of the generator near the grid of the first stage of the 2nd i.f. amplifier, or preferably at the input of the i.f. filter. With the meter on the discriminator (pin 5), tune the limiter grid circuit for maximum, using the lowest possible output of the generator that still gives a reading. Switch the meter to pin 1 and peak up the coil in the 1st stage of the 2nd i.f. amplifier (grid), again keeping the generator output as low as possible.

Locate the 2nd mixer and feed in the 1st i.f., 5.5 mc or 8 mc, as required. Just move the generator around carefully, near the frequency indicated on the dial, centering it by watching the discriminator (pin 4) and tuning for zero. Once centered, reduce output until you get only a slight increase of the limiter reading on pin 2, then retrim all the coils in the 1st i.f. amplifier. When you are satisfied that the i.f. amplifiers are peaked up, plug in the crystal and tune the oscillator (or multiplier) coil for a maximum reading on pin 6. Avoid tuning it too close to the point where the crystal drops out of oscillation.

To tune the front end you can use the signal generator, but getting it on zero can be very critical. If you have a transmitter on the frequency, initial tune up will be simplified. (Of course the transmitter should be on a dummy load.) Vary the input to the receiver by varying the length of a piece of wire plugged into the antenna jack. Keep the input down as much as possible as you peak the input coils or pipes. As the receiver approaches maximum sensitivity the local transmitter, and even the signal generator leakage, becomes too much. Then is the time to re-tune the front end on a weak, distant, signal on the frequency. Alternatively, you can build a little transistorized crystal oscillator into which you can plug a transmitter crystal. With a small (19-inch) wire antenna, more than enough 24th harmonic will be available for tune-up purposes. Figure 8 is the schematic of such a test oscillator, this one derived from W6TNS.

Operation

If you are going to do a fair amount of operating throughout the day, every day, it will be worthwhile to leave the set on 24 hours a day. Remember, there are about 30 vacuum tubes in an -80D, and even at surplus prices this represents a good sum of money. Of course, if you only operate a couple of hours each evening, you can turn off the set without fear of reducing tube life too much. (The Thermister in the primary makes this possible.) In no event, however, should you eliminate the primary fuse or use one rated at more than 2 amperes. Safety during unattended times of operation is our major concern here.

As we said before, f.m. operation is not like the usual ham rag-chewing on 2 meter a.m. If you are about to check into a channel, say 146.94, already in wide use in your area, we suggest that you do a great deal of listening before you press that mike button; and then, pattern your procedure after that being used. You will make lots of new friends, different friends, who for the most part have gotten on f.m. largely by their own efforts. Many Technician Class amateurs are on f.m. as well as many old timers with 5 meter experience. It is difficult to tell which is which, but you will soon realize that it doesn't matter. Both are generally quite adept at digging into the complexities of f.m. and both are ready and willing to help where needed. Lots of luck!

Addendum II

A word or two should be said about antennas. First of all, since f.m. is a local operation and since mobile operation is prevalent, vertical polarization has been standardized upon. Also, since continuous monitoring of a channel is standard practice, a beam would cause some traffic to be missed, so omnidirectional antennas are also standard. Into this broad category fall the ground plane antenna, the coaxial, and the vertically polarized "gain" antennas.

If you live on a hill or in a tall apartment house, the simple ground plane and coaxial antennas, such as those made by Kreckman,[6] should work reasonably well. If you have a coax run of more than 25 feet, though, it would be a good idea to use the new foam-type coax that is similar to RG-8/U. A considerable improvement, about 3 db, over the ground plane and coaxial antennas is possible if you build a 5/8-wavelength ground plane.[7]

[*Continued on page 98*]

[6]Herb Kreckman Co., Cresco, Pa.
[7]Brier, H. S., "A 5/8 Wave Vertical for 2," *CQ* February 1964, p. 45.

The Swan Model 400 S.S.B. Transceiver shown with the Model 420 V.F.O. at the right.

CQ Reviews:

The Swan Model 400 S.S.B. Transceiver

BY WILFRED M. SCHERER,* W2AEF

THE Swan Model 400 is an s.s.b. transceiver that provides full coverage on the amateur bands, 10 through 80 meters, with operation on either upper or lower sideband and with a transmitter input of 400 watts p.e.p. It also operates on c.w. and may be used on a.m., as well, producing a carrier with a single sideband.

A special feature of the Swan 400 setup is the use of two types of transistorized v.f.o.'s built as a separate unit. The Model 420 v.f.o. is designed mainly for fixed-station use and full band coverage, while the Model 406 is a small size unit intended primarily for mobile service on 200 kc segments that include the phone portion of each band (2 segments on 10 meters).

We're especially pleased to find such an arrangement on the market, inasmuch as in almost 10 years of mobile s.s.b. operation with our homebuilt gear, we've found this to be an ideal setup which enables the main part of the equipment to be mounted out of the way without cluttering up the front quarters of the car. It also provides maximum ease of operation, as the small v.f.o. can be mounted near the steering wheel or other convenient point within reach where tuning may be conducted conveniently, safely and comfortably.

Another feature which has been successful in the past with other Swan gear is that unlike other s.s.b. rigs, the Swan 400 incorporates a high i.f. with single conversion on both receive and transmit, instead of the generally used multiple-conversion systems. Spurious responses or birdies can therefore be virtually eliminated and difficulties with cross modulation and overloading may be minimized; while the high i.f. ensures excellent image rejection.

Single conversion necessitates changing the v.f.o. frequency range for each band which in turn requires operation of the v.f.o. at relatively high frequencies where frequency stability ordinarily becomes a problem, but by using tran-

*Technical Director, *CQ*.

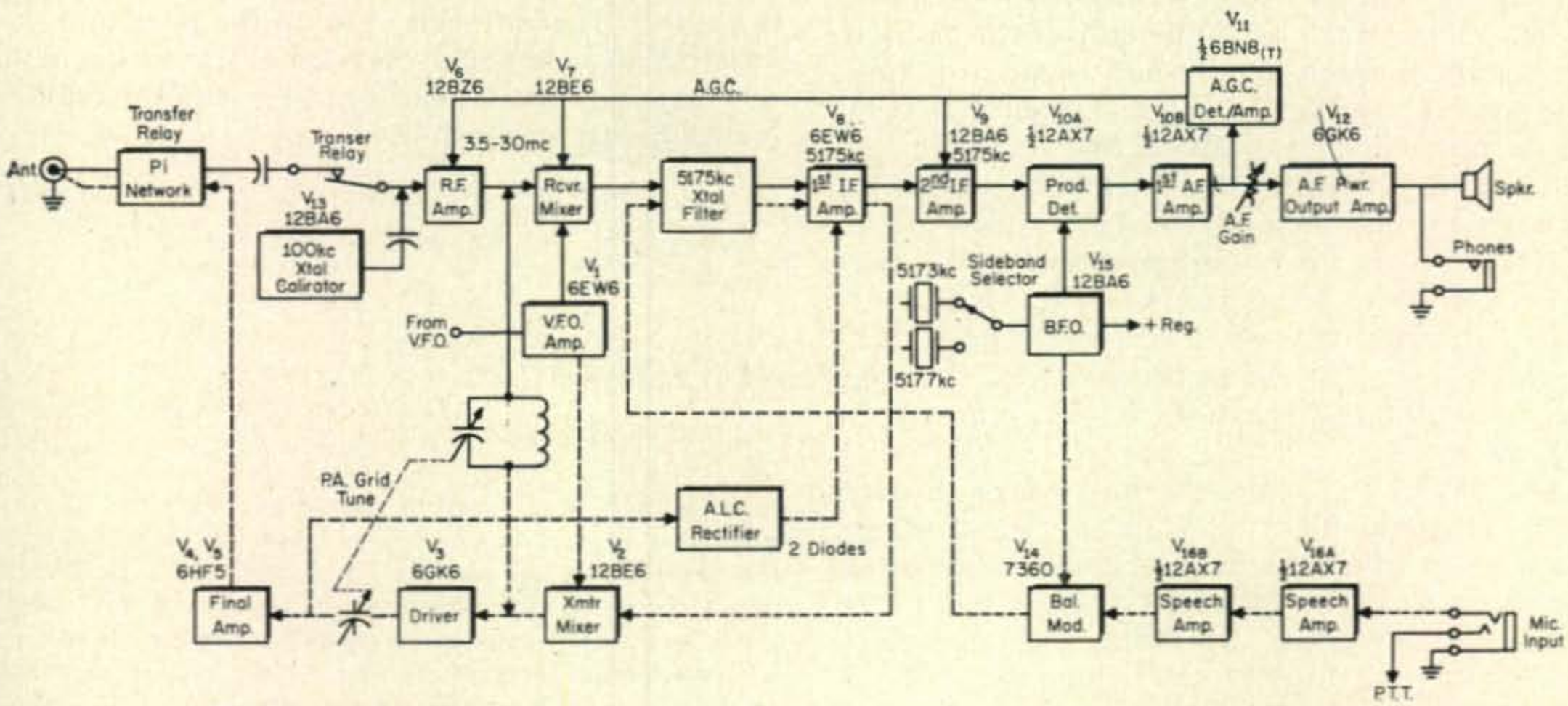
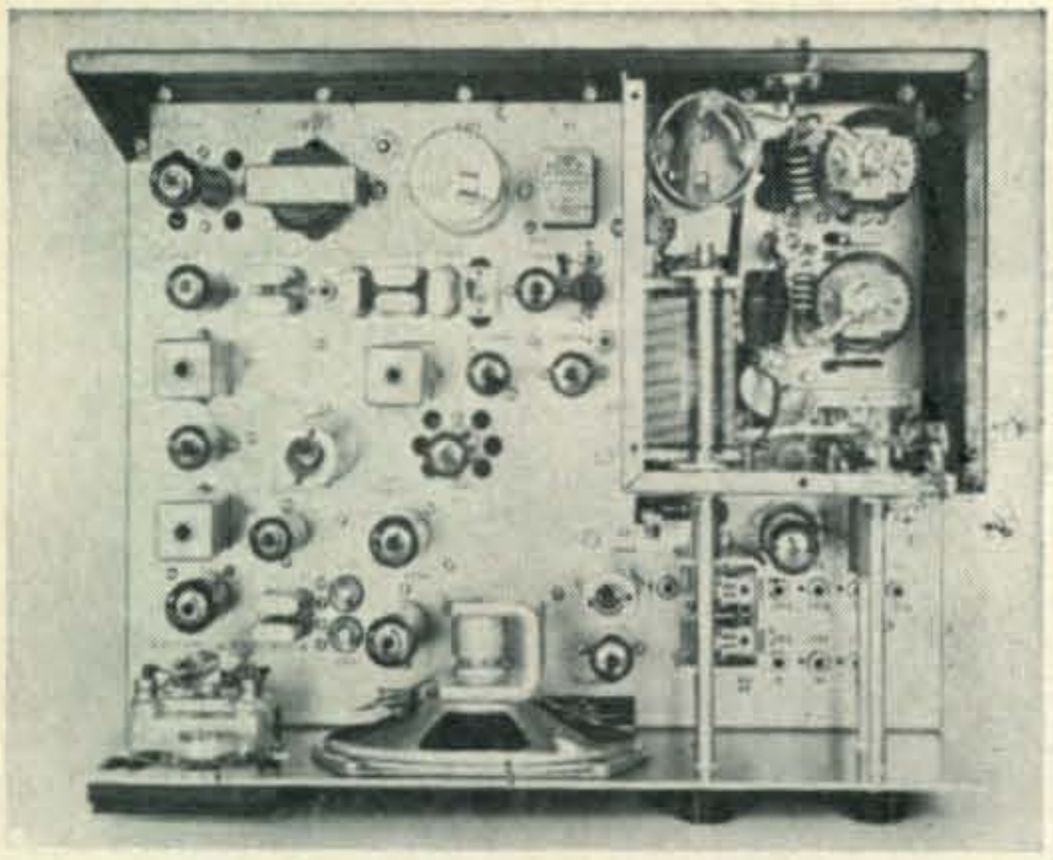


Fig. 1—Block diagram of the Swan 400. Solid lines indicate the receiver routing, the dashed lines show the transmitter setup. The bilateral stages, used both for receive and transmit, are permanently "parallel" connected for both functions. Stages not required for receive or transmit are disabled by a relay which provides cut-off bias and/or removes screen voltage. See text for v.f.o. frequencies.



Top view of the Swan 400. The final amplifier compartment is shown with the cover removed at the upper right.

sistors instead of vacuum tubes, excellent overall stability is achieved. To obtain a uniform tuning range with accurate calibrations on each band as is usually provided in s.s.b. gear, equal tracking and bandspread must be realized as well as uniform thermal stability. How these requirements are met in the Swan units is described later.

Other features of the Swan 400 include: a 15 mc band for WWV; 320 watts input on c.w.; 125 watts carrier input for single-sideband a.m.; panel meter automatically switched to read S-units or p.a. cathode current; block-grid keying for c.w.; auxiliary contacts on xmt/rcv. relay; Pi-network for 20-300 ohm loads; crystal calibrator; p.t.t. operation (or v.o.x. with plug-in accessory unit); slow a.g.c. on receive; a.l.c. on transmit; built-in loudspeaker. Power supplies are separate, one for 120 v.a.c. operation, the other for 12 v.d.c. mobile use.

Circuitry

A block diagram for the Swan 400 is shown at fig. 1. Inasmuch as single conversion is used, the lineup is quite simple and straightforward. The receiver section has an r.f. stage that feeds the mixer which heterodynes the incoming signals with appropriate v.f.o. frequencies, obtained through the v.f.o. amplifier, to produce an i.f. of 5173 kc. The v.f.o. frequencies at the start of each amateur band are: 8673 kc for 3.5 mc; 12,173 kc for 7 mc; 8827 kc for 21 mc; 22,827 kc for 28 mc. The difference products are used for 3.5 and 7 mc, the sum products for 14, 21 and 28 mc.

The 5173 kc i.f. from the mixer goes through a 2.7 kc bandwidth crystal filter to two i.f. stages and to a product detector where mixing with a 5173 kc crystal-controlled b.f.o. demodulates the s.s.b. signal for the following a.f. amplifiers. Sidebands are changed by switching to a 5177 kc b.f.o. crystal and manually retuning the v.f.o. accordingly. Due to the sum and difference relations given above, the most used sideband on each amateur band will be produced when the 5173 kc b.f.o. crystal is used.

A.g.c. is obtained by rectifying the a.f. output from the first a.f. amplifier and applying the resulting d.c. as a variable control bias to the r.f., the mixer and the 2nd i.f. stage. This arrangement necessitates an a.f. gain control at the input of the audio power amplifier instead of at the 1st a.f. stage. The a.g.c. has a slow time constant to minimize pumping and a.g.c. distortion. The S-meter is connected to the cathode of the 2nd i.f. stage where it indicates the cathode voltage which is inversely proportional to the a.g.c. control voltage; consequently, the meter is zeroed at the right and deflects "backward" with signal.

There are two traps at the input of the r.f. stage. One is tuned to 5175 kc to eliminate i.f. signal feedthrough, the other rejects 13 mc signals that could otherwise produce a 5175 kc i.f. signal by beating against the second harmonic of the v.f.o. on 20 meters. See fig. 2.

Transmitter

The transmitter lineup also is a simple one. A 5173 kc carrier signal from the b.f.o. and the a.f. from the two-stage mic amplifier are applied to a 7360 balanced modulator where a suppressed-carrier double-sideband signal is produced. This signal is then fed to the crystal filter where one sideband is rejected. The s.s.b. signal from the filter goes to the 1st i.f. amplifier and on to the transmitter mixer to which the v.f.o. signals also are applied to produce a frequency in the desired amateur band.

Crystal Filter

In the early model *CQ* received for test the sideband filter had four crystals in a typical high-frequency filter configuration with the addition of a fifth crystal that is shunted across the L/C circuit in the filter. This crystal provides a notch near the "normal" carrier frequency of 5173 kc and creates a very steep skirt on this side of the filter. High carrier and sideband suppression can then be obtained while the carrier is positioned close to the passband in order to provide better-than-usual low-frequency a.f. response that makes a more pleasant sounding s.s.b. signal possible.

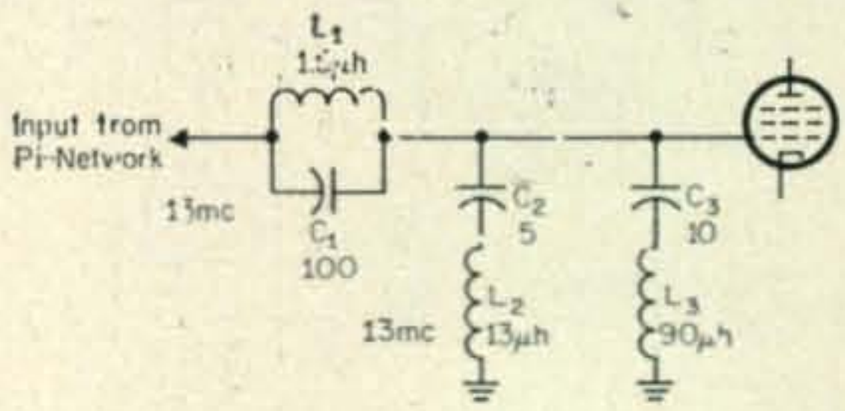


Fig. 2—Input traps used in the Swan 400. The 13 mc trap must have a very high Q in order not to attenuate the desired 14 mc signals. This requires a parallel-tuned circuit (L_1, C_1) connected in series with the tube grid; however, such an arrangement necessitates a low-impedance load at 13 mc which in this case is provided by a 13 mc series-tuned circuit (L_2, C_2) across the tube input. Use of just a shunt-connected series-tuned affair of high Q would present a low reactive impedance at other frequencies which could disastrously cut down the overall gain for desired signals. L_3 and C_3 make up a series-tuned trap for 5175 kc.

This also causes the filter to be unsymmetrcial with a more gradual slope found on the opposite skirt. Thus, when sidebands are switched with the b.f.o. carrier at 5177 kc on the sloping side of the filter, the suppression is somewhat less; nevertheless, it is within acceptable limits.

In this connection, the 5173 kc carrier and the steep-skirted side of the filter are used for normal operation, so that the improved suppression and a.f. quality obtained thereby may always be realized when transmitting the customary sideband for the particular amateur band; that is, l.s.b. on 40 and 75, u.s.b. on 10, 15 and 20 meters. The poorer side of the filter is used only for the seldom-used sideband.

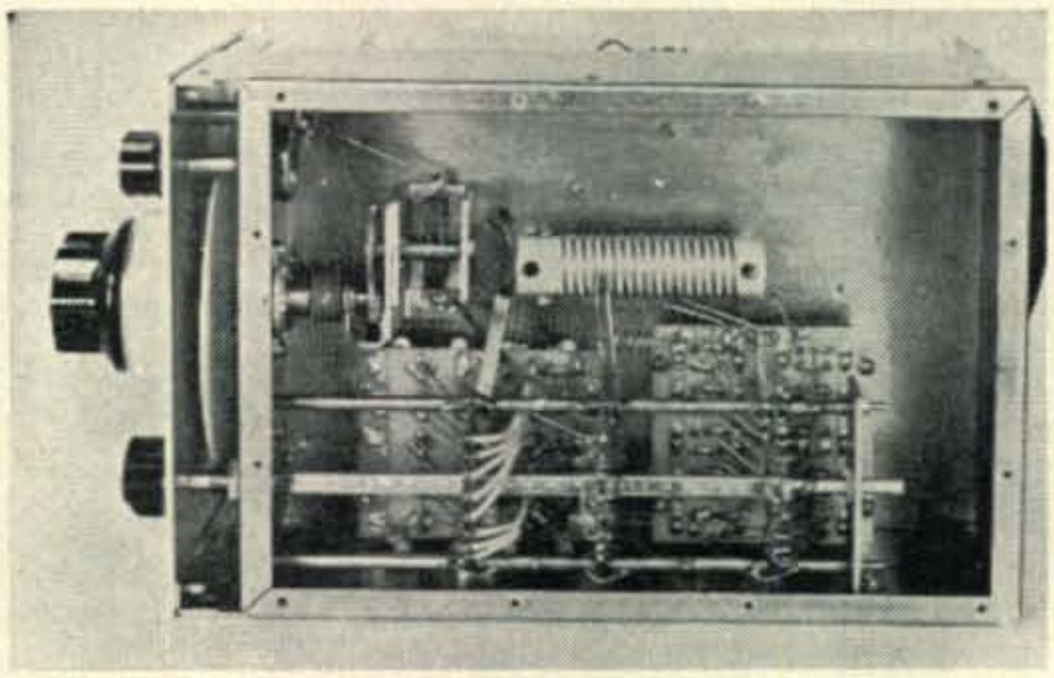
A 2.7 kc six-pole lattice filter is being installed in current production models of the 400. The filter response is symmetrical with a shape factor of 1.7. Suppression is further improved and is alike for either sideband.

Output Amplifier

The mixer feeds a driver stage for the final amplifier which has two 6HF5 pentodes in parallel operating class AB_1 and which may be driven to at least 400 watts p.e.p. input. The output circuit is a conventional Pi-network with coarse and fine loading provisions for matching to impedances of 20-300 ohms. The amplifier is neutralized by the standard capacitance-bridge method, except individual fixed capacitors are switched in at the by-pass leg of the bridge to maintain optimum neutralization on each band.

The Pi-network also serves as the tuned input for the receiver r.f. stage which is disconnected from the circuit by a relay during transmit. The same tuned circuits that are used between the r.f. stage and the receiver mixer also are used between the transmitter mixer and driver. These stages are thus simultaneously tuned when peaking is made on either transmit or receive.

A.l.c. for the transmitter is a standard system whereby an a.f. voltage, produced in the final grid circuit as soon as excess drive is applied during modulation, is rectified with a voltage doubler and then is applied as a d.c. control bias back to the 1st i.f. stage.



Bottom view of the Swan Model 420 v.f.o. The main inductor is wound on a ceramic form at the center. Capacitance and inductance trimmers are on printed-circuits boards under the bandswitch. The transistors and associated circuitry are on a board on top of the chassis.

For tuneup, a carrier is obtained by unbalancing the modulator and by shifting the frequency of the carrier crystal several hundred cycles within the filter passband. The latter is accomplished by switching capacitors across the crystal to "rubber" it. A similar arrangement is employed with c.w. operation for which grid-block keying is provided. During transmit the meter circuits automatically change over to read cathode current of the final.

The v.o.x. accessory module is a transistorized affair which plugs into an octal socket on the left of the rear apron on the transceiver in such a manner that positions the v.o.x. level, delay and anti-trip controls so that they are accessible from the side. Power supply requirements for the 400 are: 12 v.a.c. or d.c. @ 5a., 12 v.d.c. @ 250 ma, —110 v.d.c. @ 100 ma, 225 v.d.c. @ 150 ma and 800 v.d.c. @ 500 ma. These voltages are available from the Model 117-XC a.c. power supply or from the Model 14-117 d.c. unit.

The V.F.O.s

Besides utilizing transistors for stability, the v.f.o. is contained in a separate cabinet to eliminate wide temperature excursions and frequency drift that might otherwise occur from heat generated by tubes or other components in the main unit. Circuitry for the v.f.o. is shown at fig. 3. Two type 2N706 silicon transistors are used. One functions as the oscillator in a grounded-base Colpitts circuit, while the other is an emitter-follower output stage that matches to a low-impedance cable which connects the v.f.o. to the main unit. A Zener diode in the latter provides regulated voltage for the v.f.o.

There are two hairlines on the dial fiducial. One is used for upper sideband, the other for lower sideband. These are needed, because when sidebands are switched, the b.f.o. carrier crystals are changed accordingly, but the v.f.o. frequency is not. This requires a different calibration point to which the v.f.o. must be retuned by about 4 kc. The dial-drive mechanism is a two-speed affair that provides fast tuning with an inner knob or slow tuning with an outer knob. One revolution of the latter covers only 7 kc.

A panel-controlled trimmer, connected across the main tuning capacitor, is furnished as a dial-set for calibration purposes. The r.f. gain for the receiver also is located on the v.f.o. panel.

The output from the v.f.o. is quite low, so a vacuum-tube amplifier is incorporated in the main unit to bring the level up as needed. The coax line between the two units is fed directly to the tube grid which is heavily swamped with a 75-ohm resistor. The amplifier is thereby completely stabilized and r.f. feedback or reactive effects from this stage, that might otherwise affect the v.f.o. frequency, are eliminated. This is further aided by coupling the emitter-follower lightly to the emitter of the v.f.o. The 75-ohm resistor also provides a matching termination for the coax line.

The setup for the Model 406 mobile v.f.o. is

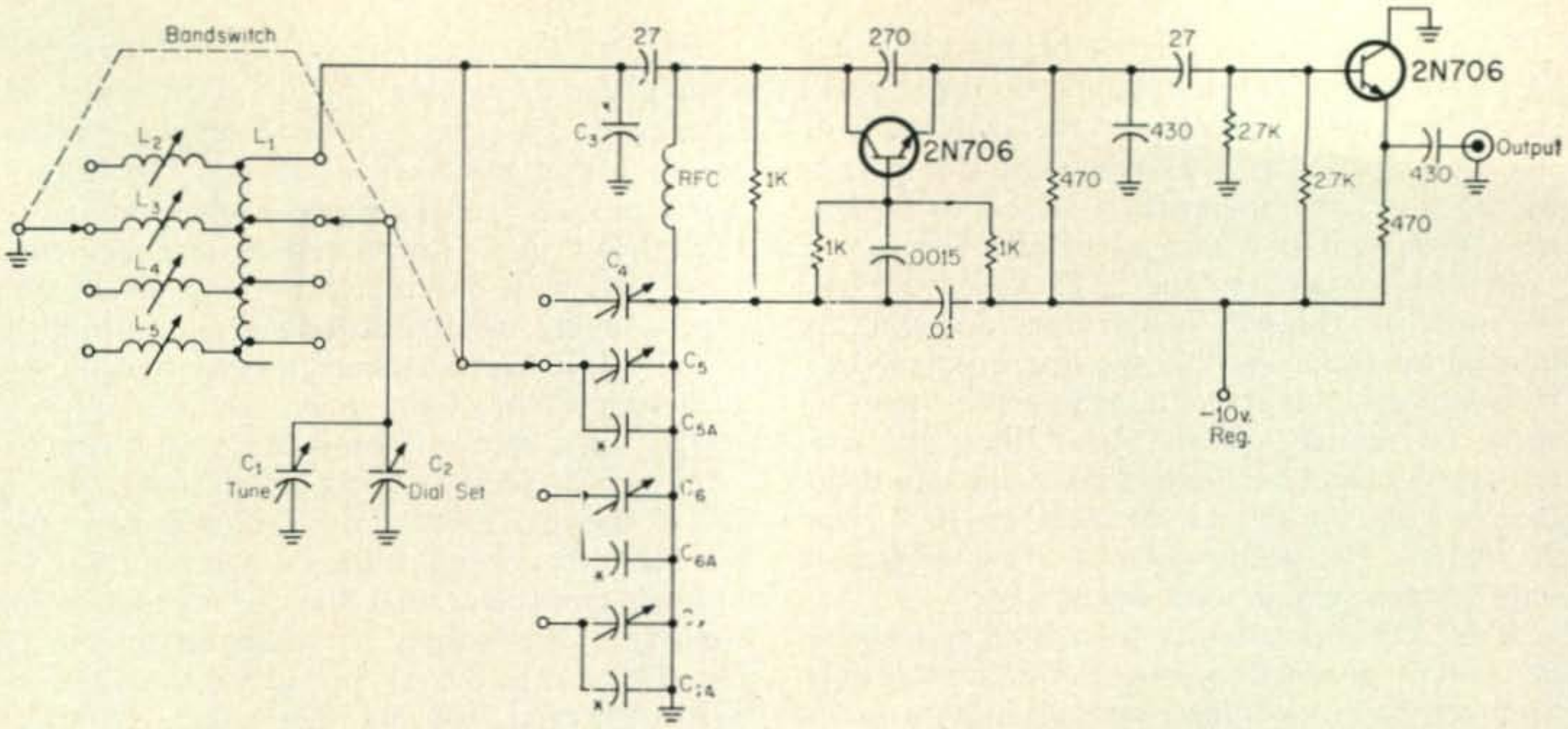


Fig. 3—Basic circuitry for the Swan Model 420 v.f.o. 20 different 200 kc ranges are selected by the bandswitch which chooses the proper tap on the main coil (L_1) and selects trimmers for *both* capacitance and inductance which makes it possible to obtain exact tracking with a single scale on the dial. Separate temperature-compensating capacitors (marked with an asterisk) are switched in to optimize stability on each range. Only 4 positions are shown for the sake of clarity.

like that of the Model 420, except for the limited band segments, the lack of a dial-set and its smaller size.

Performance

Performance-wise, the Swan 400 behaved in this fashion: Receiver sensitivity, 0.2 μv or better for 10 db S/N ratio (rated at 0.5 μv); i.f. signal rejection (5175 kc), —55 db on 3.5 mc band, 70-80 db on all other bands; image rejection —65 db average; sideband suppression at 1 kc, 50 db on normally-used sideband position, —40 db for the other sideband position; carrier suppression, better than 50 db.

Using the Model 420 v.f.o. (we did not have the Model 406 on hand) the frequency stability on all bands, except 28 mc, was 100 c.p.s. drift for the first 5 minutes (starting with normal room ambient), settling down to less than 25 c.p.s. per hour thereafter. On 28 mc the v.f.o. drift was 300 c.p.s. every 10 minutes for the first hour, after which the rate was considerably slower. It is understood that this is being improved by the manufacturer. The v.f.o. tuning was exceptionally smooth and the 2 kc dial calibrations, which are spaced a little over ⅛" apart, made it possible to read the frequency to 1 kc. Reset accuracy and linear tracking was as good as the dial could be read.

One difficulty encountered was that on some bands it was not possible to set the dial calibrations right to the 100 kc markers of the crystal calibrator. No doubt, this could have been corrected with realignment on the ranges concerned. Mechanical stability was quite good, requiring a heavy bang on the cabinet to make the v.f.o. frequency twitter.

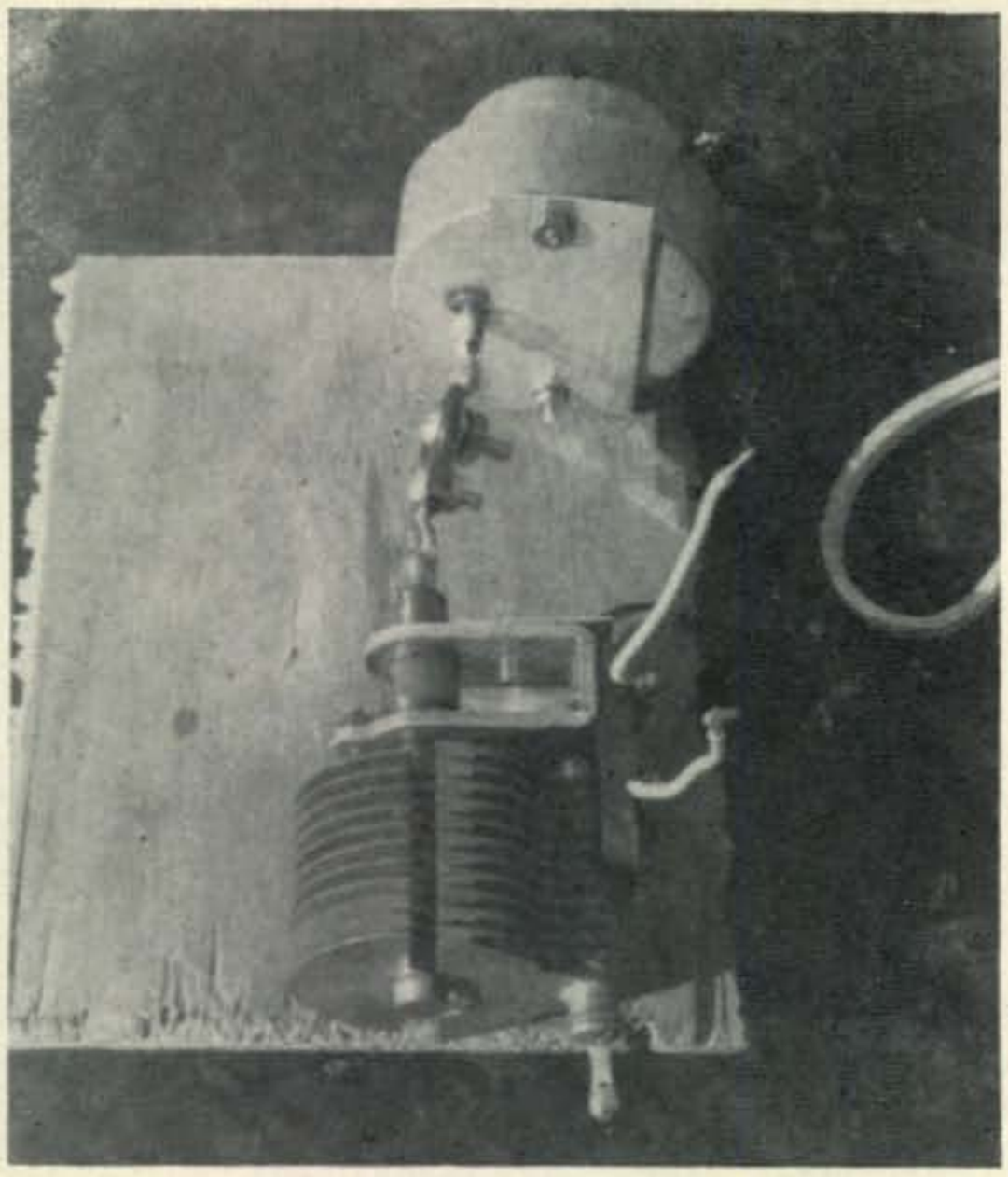
A.g.c. action was very smooth. The receiver frequency response produced nice sounding audio output; however, with the r.f. gain set for signal levels a little above the a.g.c. threshold, some dynamic distortion at low audio frequencies was evidenced, but since we're usually super critical, chances are that this would go un-noticed by most amateur operators. At any rate, if it should be bothersome, you can crank down the r.f. gain and bring up the a.f. gain accordingly to obtain really clean a.f. quality (this is the way we personally prefer operation anyway, especially since we've run into similar situations with a number of other receivers).

The transceiver handles nicely, but one thing you have to remember is that when bands are changed, you have to reset a bandswitch on *both* the transceiver and the v.f.o. You also have become accustomed to the backward reading S-meter.

The transmitter tunes up easily to 325 watts "d.c." input that produces 200 watts output for an efficiency of a little over 60%. With s.s.b. voice modulation the input is a good 400 watts p.e.p. with 250 watts out. Two-tone test patterns indicate good linearity and a.l.c. control is excellent with no evidence of flattopping, even with the mic gain cranked up; however, excess mic gain or abuse of a.l.c. is not recommended, because deterioration of the signal can set in as with any such limiting device. On-the-air reports indicated a good quality s.s.b. signal. C.w. also was reported to be good; however, you can't work break-in with c.w., as the set must be manually switched for transmitting in this mode.

The Swan 400 is cleanly laid out both externally and internally. The panel meter is a good size for easy readability and the control knobs are well designed. The key jack is conveniently located on the front panel instead of at the rear. The v.f.o. dial is exceptionally well lit up and readable, while the tuning is as smooth as velvet.

The Swan Model 400 S.S.B. Transceiver is priced at $395. Prices for the other units are: Model 420 v.f.o., $120; Model 406 v.f.o., $75; Model 117-XB a.c. power supply, $75; Model 14-117 d.c. power supply, $120; Model VX-1 v.o.x. accessory, $35.—*W2AEF*



View of a temporary element tuning capacitor and drive motor described in the text.

REMOTE ANTENNA TUNING

BY RONALD LUMACHI,* WB2CQM

ANTENNA characteristics with respect to various ground potentials, to say the least, are unpredictable. An array adjusted at a height other than the operating level will, as a consequence, reflect varying input and front-to-back values as the unit is raised and lowered. The amateur antenna builder therefore is either content with the compromised adjustment made at ground level, or simply labors to raise and lower the array for the difficult cut-and-try pruning method of tuning. Each alteration necessitates replacement at the operating level, compilation and evaluation of valid QSO data, and finally a subsequent adjustment made from the digested information; a tedious and tiresome endeavor to say the least. For those interested in installing a remote tuning unit for accurate operating height adjustment for a quad reflector (or gamma matched yagi driven element), read on.

Antenna adjustment reduces itself to the problem of determining compatible element relationships. For example, the quad reflector unit will exhibit superior properties when the resonant frequency is lower (larger periphery); however, the arrival at the *precise* electrical length often escapes the amateur adjusting elements at ground level.

By inserting a variable capacitor in series with the driven element of the gamma matched yagi or any element of the quad, and varying the plates remotely with the antenna at the normal operating height, the amateur can easily adjust his system for maximum performance. Bear in mind that element lengths are determined only with *reasonable* accuracy when the length versus frequency formulas are utilized.

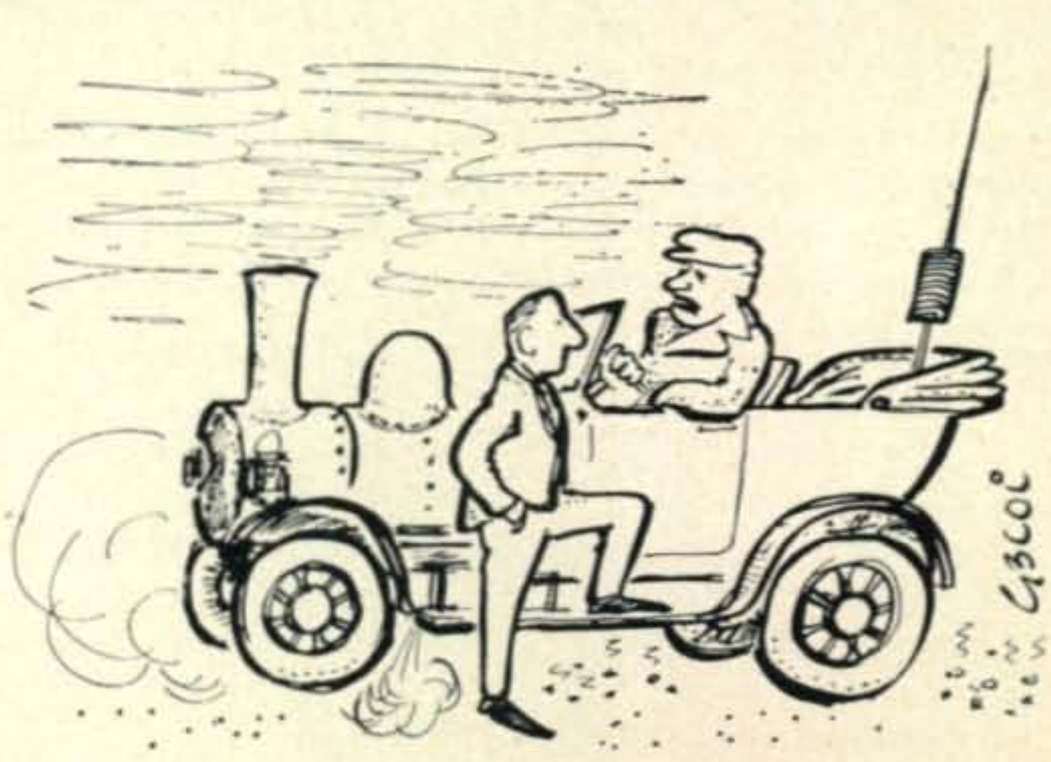
Evaluation

Install the remote controlled series capacitor and face the array away from a known signal source. Minimum S meter deflection will indicate a maximum front-to-back relationship. Evaluation from this point is rather simple. For example, if the plates of the capacitor are half meshed it can be assumed that the electrical length is somewhat short. Either replace the remote unit with an equal value of fixed capacitance or in the case of the quad add additional length. The converse would be true if minimum signal detection occurs with the capacitor plates unmeshed. Elements must be shortened.

Construction

Construction is rather straight forward using a 1 or 2 r.p.m. synchronous motor. A 100-150 mmf capacitor with a ball bearing is coupled to the shaft of the motor. Since the capacitor shaft is hot, it is necessary to insulate the units. Fabricate the coupling from a small piece of phonelic board, plastic or polystyrene sheeting. Any small piece of aluminum or thin steel stock serves as the motor angle bar support. Feed the motor the required voltage and proceed with the adjustments. If desired, the arrangement can be made permanent with a waterproof housing and a small battery operated type of motor. ■

*73 Bay 26th Street, Brooklyn, N.Y. 11214.



"Well at least there's no ignition QRN problem."

RTTY From A to Z

BY DURWARD J. TUCKER,* W5VU

PART XX

Last month's installment covered the teletypewriter servicing requirements and a portion of the lubrication points of the Model 15 machine. This installment covers additional lubrication points for the Model 15 machine.

Lubrication Points

Figure 115(c) gives the lubrication points for the bottom of the type bar carriage. Lubrication points for the bail unit assembly are shown in fig. 116. Figure 117 shows the lubrication points for the bottom of the typing unit. This figure also gives an excellent view of the drive shaft with the selector mechanism clutch shown in the right half of the picture. A portion of the selector mechanism may be seen further to the right and the bottom edge of the range finder on the extreme right. Unfortunately a number of important lubrication points are not sufficiently visible in the bottom center fore-front of fig. 117 to point them out and these are described in the caption.

*6906 Kingsbury Drive, Dallas 31, Texas.

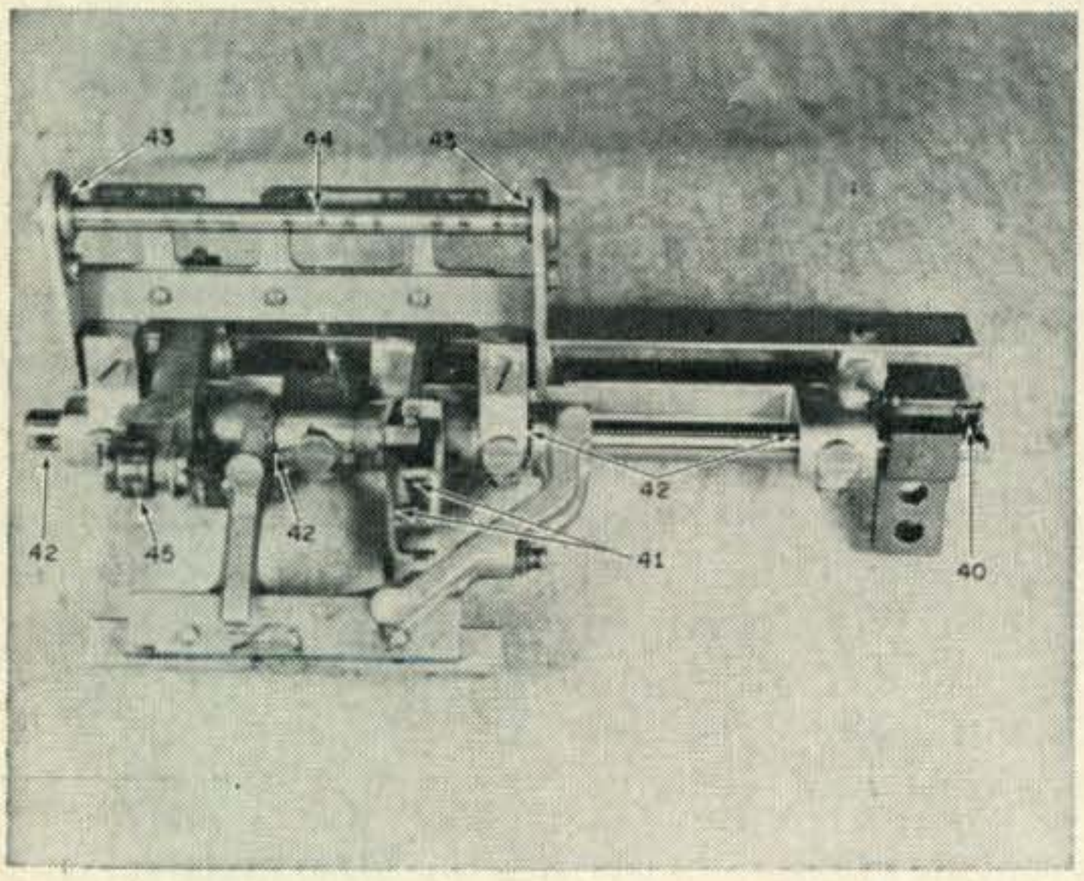


Fig. 116—View of the Model 15 bail unit assembly showing the general construction and lubrication points. Points marked *A* receive 1 or 2 drops of SAE 10 and those marked *B* receive Lubriplate No. 630-AA.

40. Bail assembly shaft bearings (2 oil cups). A[1]
41. Between spacing pawls. A
42. Function bail and printing bail operating arm bearings. A
43. Function lever bail roller (two bearings).
44. Roller surface. B
45. Functioning bail and printing bail operating arm and rollers. B[2]

[1] Fill cups.
[2] Sparingly.

Lubrication points for the carriage return mechanism are shown in fig. 118.

Figure 119 gives the lubrication points for the main shaft of this machine. Not shown in fig. 118 or 119 is the oil plug in the right end of the main shaft. Listed as oil point 87 it may be seen on the left side fig. 117 (back and bottom view of unit), which also gives an excellent, but reversed view of the main shaft. Be sure to not miss this important point and the full instructions that are given for point 87. Not shown and out of view to the left in fig. 119 are other main shaft lubrication points as listed in the caption. Other parts of the machine make it difficult to photograph these points without removing the shaft from the machine and after all, the owner

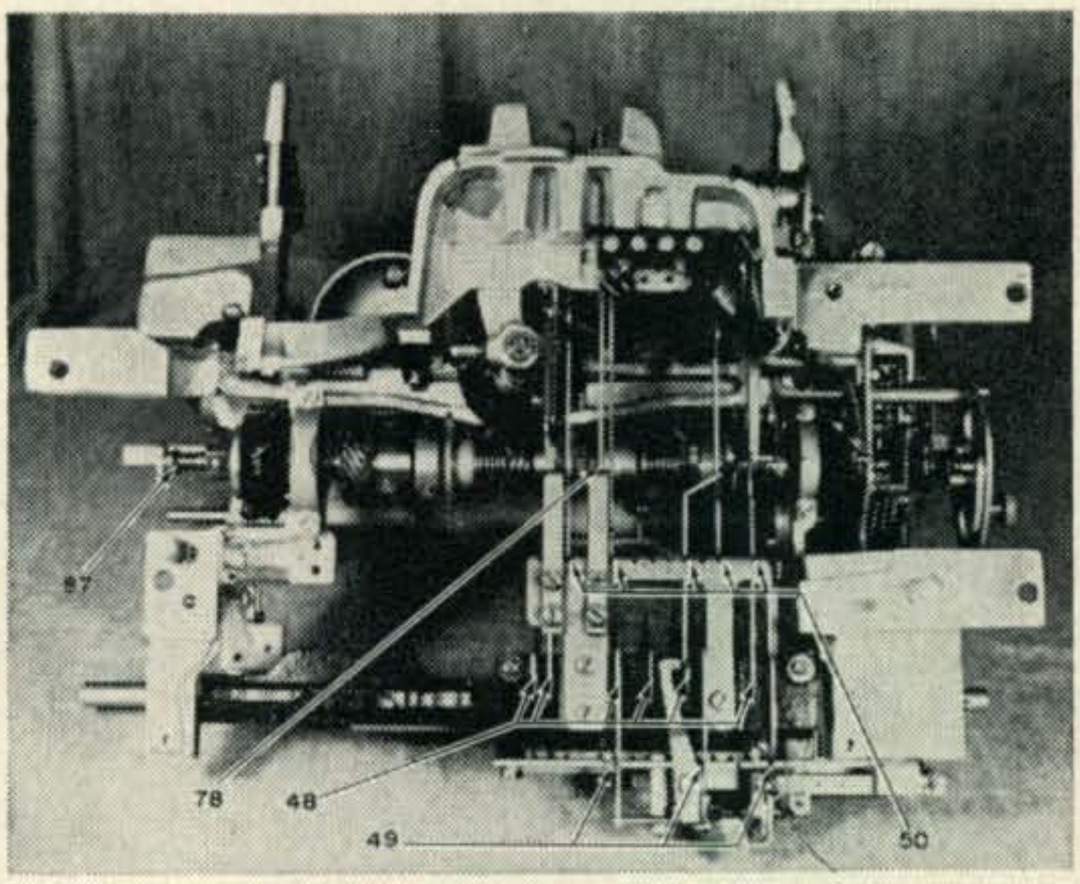


Fig. 117—View of the bottom of the Model 15 typing unit showing the lubrication points. Note also the general view of the main shaft. Points marked *A* receive 1 or 2 drops of SAE 10 and those marked *B* receive Lubriplate No. 630 AA.

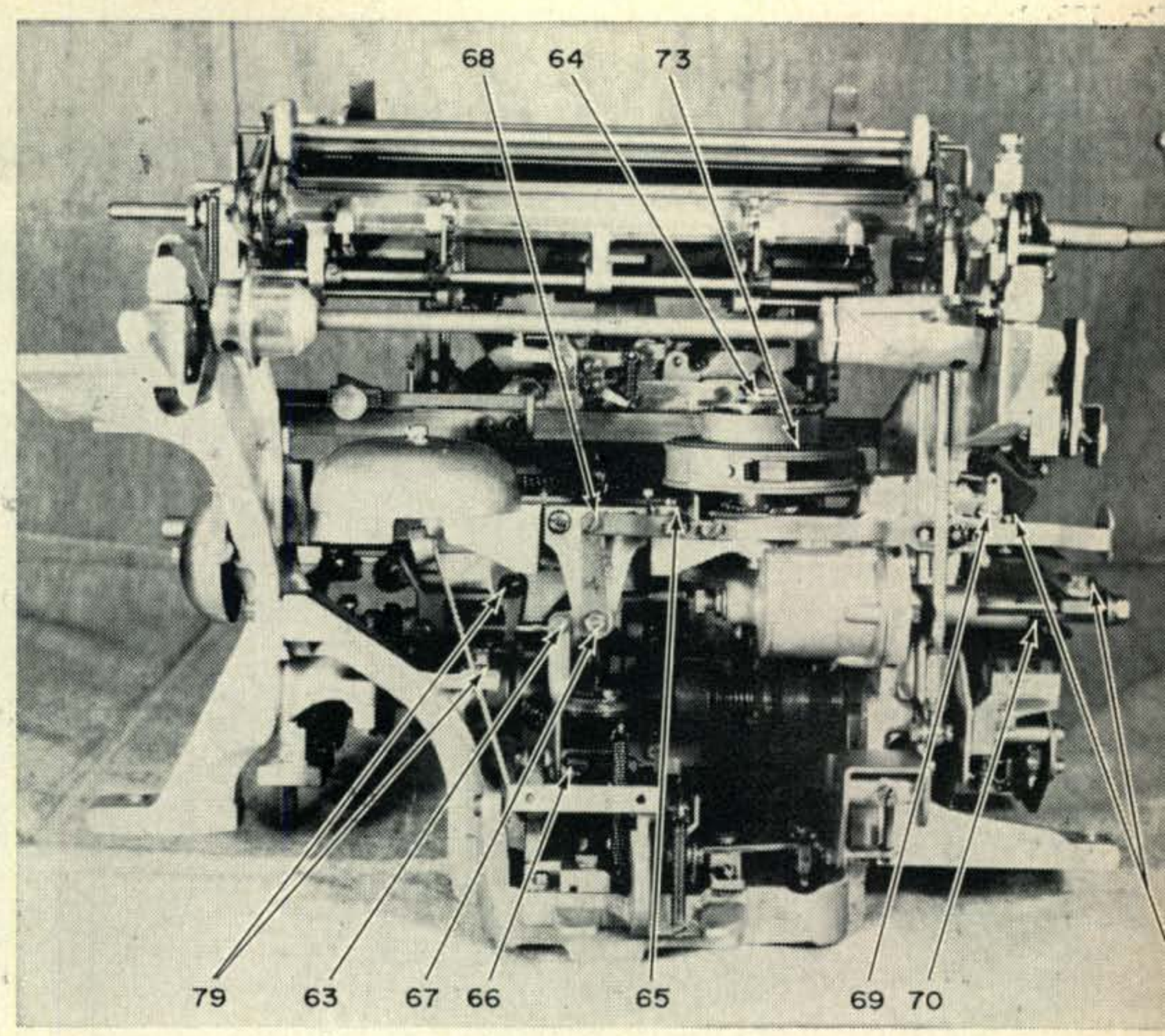
48. Function levers in vane frame slot. A
49. Function levers in slot in break mechanism plate. A
50. Push bars and latch bars in function lever comb. A
78. Bell latch bar at point of engagement with latch. A[1]
87. Main shaft. A[2]

Lubrication Points Not Visible

Carriage return clutch members prongs. A
Carriage return latch bar at point of engagement with latch. B[1]
Carriage return clutch release fork and operating lever bearings. A
Carriage return push bar and latch bar operating lever shoulder screw. A
Carriage return operating lever stop screw. B

[1] Sparingly.
[2] Hold right end of teletype up 6" and remove oil plug. Fill shaft until oil runs out of left end.

Fig. 118—Lubrication points for the Model 15 carriage return mechanism. Points marked *A* receive 1 or 2 drops of SAE 10 and those marked *B* receive Lubriplate No. 630 AA. Call-out 79 should be 74.



63. Carriage return locking bar bell crank link shoulder screw. A
64. Carriage return spring drum bearing. A
65. Carriage return spring release lever shoulder screw. A
66. Clutch release fork link shoulder screw.
67. Locking bar bell crank upper cross bar casting shoulder screw. A
68. Locking bar and locking bar bell crank shoulder screw. A
69. Locking bar latch and left hand side frame shoulder screw. A
70. Dashpot piston rod rubbed over surface of piston. A[1]
71. Dashpot lever mounting screw, and roller mounting pilot screw at point of contact with left hand margin adjusting screw. B[2]
73. Carriage return spring through oil holes in drum. A
74. The "figures" and "letters" push bar shoulder screw. A

[1] One drop, [2] Sparingly.

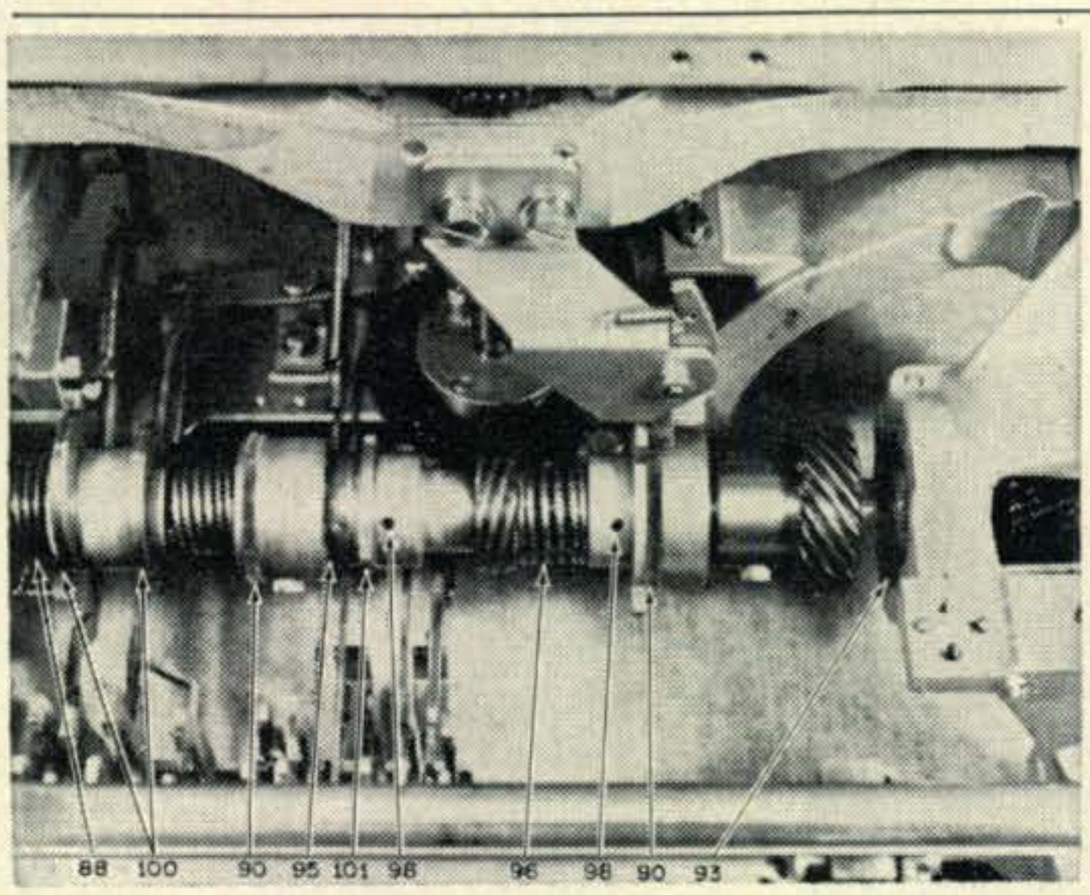


Fig. 119—Lubrication points for the main shaft of a Teletype Model 15 machine. Points marked *A* receive 1 or 2 drops of SAE 10 and those marked *B* receive Lubriplate No. 630 AA.

88. Main clutch sliding member. A[1]
90. Main shaft friction washers. A[2]
93. Main shaft right ball bearing. A, B[3]
95. Thrust bearing on end balls. A
96. Spacing clutch spring coils. A[4]
98. Cam unit and spacing clutch in oil holes. A
100. Main shaft cam surfaces. B[5]
101. Spacing escapement ratchet teeth. B[5]

Lubrication Points Not Visible

Main shaft (point 87 in fig. 117.)
Locking lever cam, felt washers on selector cam assembly. A
Selector cam sleeve on each cam peak. A
Main shaft left ball bearing. A, B[3]
Spring which compresses friction washers of cam assembly. A[6]
Main clutch caming surface. A

[1] Oil freely.
[2] Saturate.
[3] Apply 1 or 2 drops of *A*, turn shaft; apply thin coat of *B*; turn shaft a few turns; apply 1 or 2 drops of *A*.
[4] Permit oil to flow between prongs of driver member of spacing clutch and worm gear sleeve.
[5] Sparingly.
[6] Apply sparingly to coils (oil will flow between prongs of nut on main shaft and friction disk which engages this nut).

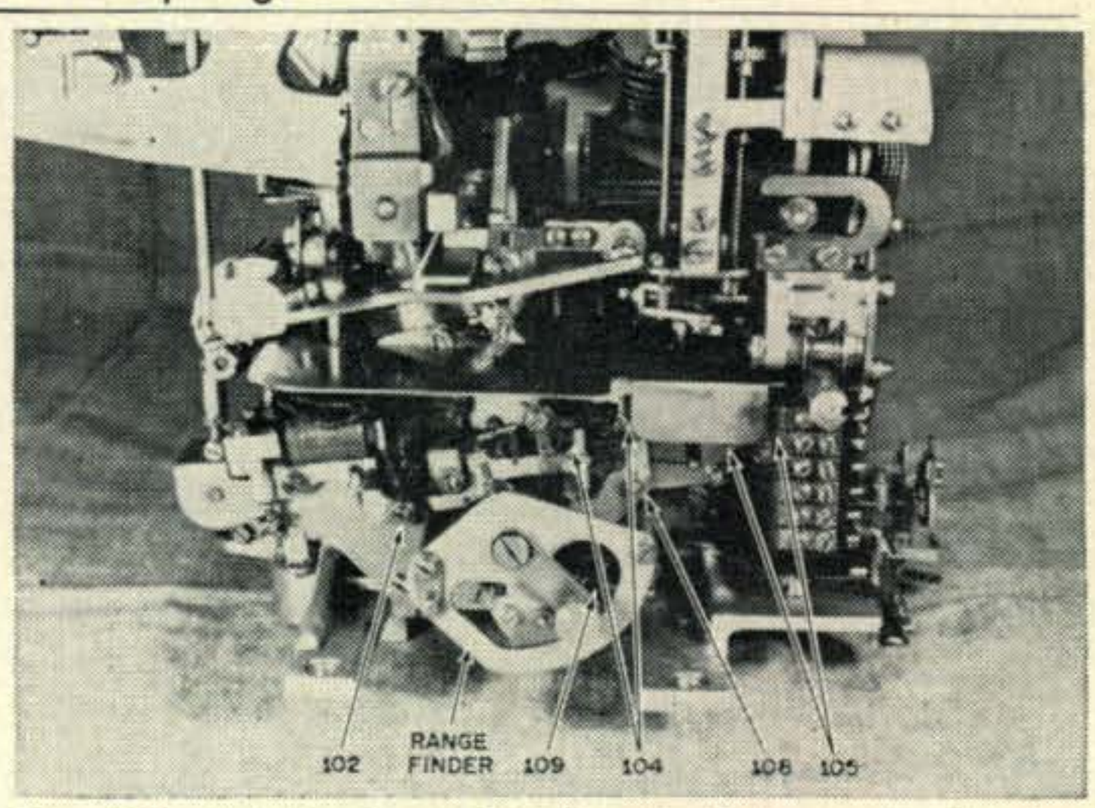


Fig. 120—Lubrication points for the Selector Mechanism of a Teletype Model 15 machine. All points are lubricated with 1 or 2 drops of SAE 10.

102. Armature bearings (2).
104. Swords and selector levers between separating plates.
105. "T" levers on all points of contact.
108. Motor stop pawls shoulder screw and lever bearings.
109. Release lever bearings, contact lever bearings and where contact lever protrudes through break mechanism plate.

Lubrication Point Not Visible

Trip latch plunger, trip latch and bell crank lever and stop lever of range finder assembly.

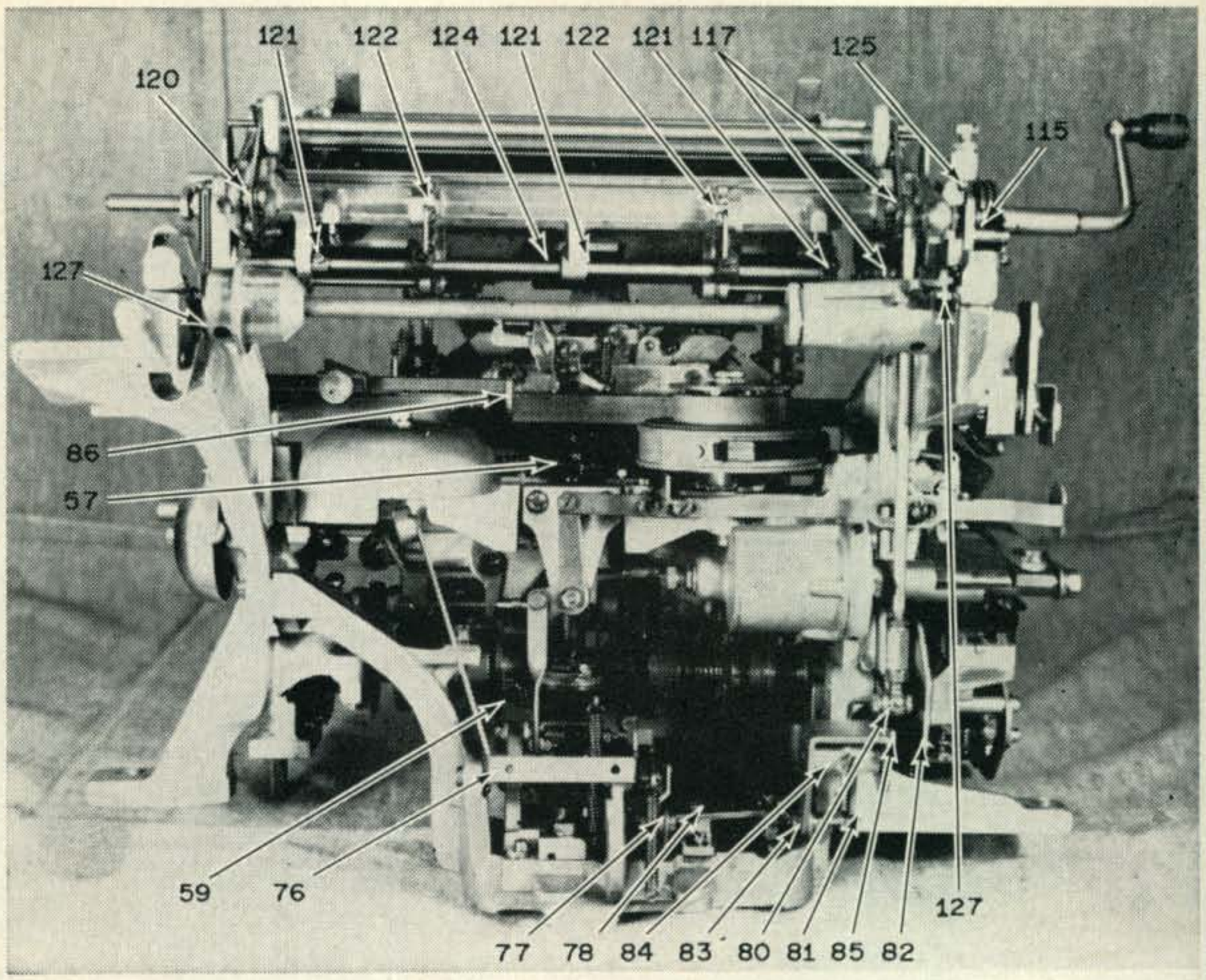


Fig. 121—Lubrication points at the back of the Model 15 typing unit. Points marked *A* receive 1 or 2 drops of SAE 10 and points marked *B* receive Lubriplate No. 630-AA.

57. Spacing shaft in upper bearing; lever bearing fill oil cup. A
59. Spacing gear (lower). B[1]
76. Bell striker arm and arm operating lever bearings. A
77. Bell push bar and latch bar shoulder screw. A
78. Bell latch bar at point of engagement with latch. B[1]
80. Bell crank lever and operating lever shoulder screw. A
81. Bell crank lever and operating lever joint. A
82. Shift vertical link, lower and detent lever shoulder screw. A
83. Line feed push bar and bell crank lever shoulder screw. A
84. Bell crank lever mounting shaft. A
85. Vertical link and bell crank lever, lower end, shoulder screw. A
86. Margin bell shaft, 2 bearings. A
115. Shift detent roller. B[1]
117. Line feed and shift vertical links. A
120. Paper straightener rod supporting lever bearings. A
121. Pressure roller release shaft and crank bearings. A
122. Pressure roller release cam crank and shoulder screws. A
124. Pressure roller sleeves. A[2]
125. Letters and figures stop screws. A[3]
127. Paper spindle bearings. A

[1] Sparingly.
[2] One drop each.
[3] Grease ends.

must locate and grease these points with the shaft *in place*.

Figure 120 gives the lubrication points for the selector mechanism for the same machine. Not visible in fig. 120, and listed in the caption is the trip latch plunger, trip latch and bell crank lever, and stop lever of the range finder assmbly. These points should not be overlooked in the lubrication of the machine.

Lubrication points for the back of the typing unit are shown in fig. 121 and fig. 122 for the front of the type unit. An excellent view of the various parts of the type unit is also shown in fig. 122.

The various views given above, as well as in figs. 13 through 23 in the first part of this text, should give the reader an opportunity to study the various mechanisms as well as locate the lubrication points. These views should aid the reader in locating and identifying the various parts of his teletypewriter. Data given here covers a considerable portion of the equipment in general use by the amateur and should be a sufficient guide in the lubrication of other machines.

Adjustments

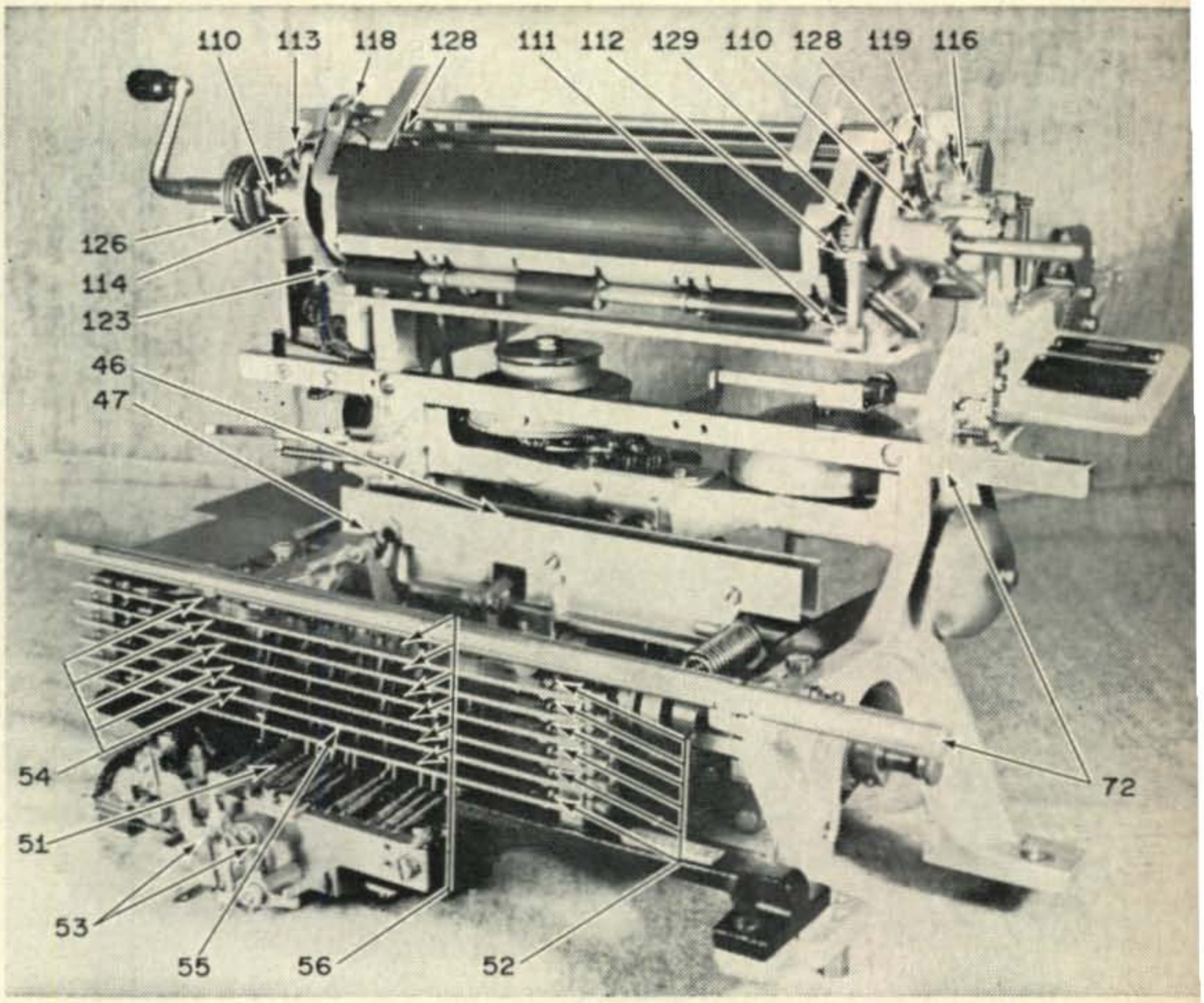
One might reason that this section heading could have just as well been "Tighten." Adjustment does not always mean "tighten as far as it will go" in all cases in a teletypewriter. Above all, one should not tighten every screw, nut or bolt, just because it can be turned. The fact that it can be turned may be because it is a part of some adjustment. In fact, loose screws, bolts and nuts should never be tightened until you have fully determined that they *are not* a part of some adjustment of spacing, tension, *etc.* Fittings should not be tightened beyond the pressure for which they were designed. Such abuses subject the affected parts to damage and breakage.

Adjustments are only to be made when they are necessary to restore normal operating conditions. It is important that *proper tools and gauges* be used to make adjustments. All adjustments must meet the requirements for *tolerance limits,* for clearance, speed, spring tension, *etc.* Many adjustments must be made in accordance with a specific sequence. In some instances one adjustment is so related to others that they too must be subsequently adjusted, or at least checked. Such an inter-relation or overlapping of functional adjustments may require several "touch-ups." A beginner or inexperienced person should be very cautious in the adjustments that they attempt to make. It is just as important to know *what not to do* as well as what to do in such instances. Specific instructions and details for making important adjustments for the keyboard transmitter mechanism and selector magnet mechanism will be covered further along in the text.

Next month we will discuss fortuitous distortion originating in teletypewriter keyboards. Ways and means of servicing and adjustments to get rid of printing errors from this source of trouble will be given.

[*to be continued*]

Fig. 122—This view of the type unit shows the various parts as well as the lubrication points. Lubrication points marked *A* receive 1 or 2 drops of SAE 10 and points marked *B* receive Lubriplate No. 630-AA.



46. Printing bail blades where plunger operating roller engages blades. A
47. Printing bail, adjusting screw head. B[1]
51. Sixth vane extension spring in slot in letters push bar. A
52. Vane Pilot screw bearings. A
53. Send-Rec. Break mech. intermediate lever mtg. screw and reset lever pivot screw. (Get no oil on friction spring washer of Send-Rec-Break mechanism T lever.) A
54. Vane's front edges where bell crank's slotted ends slide in engagement with vanes. A
55. Sixth vane detent roller. A
56. Locking function lever. B[2]
72. Type bar carriage assembly on upper and lower track surfaces. A
110. Shaft bearings in each shaft hub. A
111. Line feed detent lever mounting shoulder screw. A
112. Line feed detent roller. A
113. Single-double line-feed lever between flat spring and denting cam and where single-double line feed lever fits into groove in platen shaft hub. A
114. Line feed pawl and line feed lever shoulder screw. A
116. Platen unit pivot bearings. A
118. Paper knife supporting arms and paper guide bearings. A
119. Paper straightener lever bearings. A
123. Pressure roller shafts on bearing surface. A
126. Platen friction disc assembly, felt washers. A[3]
128. Line feed check lever shaft bearings. A
129. Line feed detent rachet. B[1]

[1] Sparingly.
[2] Apply grease in notches.
[3] Saturate.

3rd ANNUAL MOTORCADE

"South of the border, down Mexico way"

DURING the weekend of November 19, 20, 21, 1965, the third annual motorcade was conducted by the Southern California and Mexico Amateur Radio Mobile Group under the leadership of "Duke" Ellington, W6OZD, and Howard Matthews, W6AVN, co-directors of this group. Forty special temporary operating permits were issued to members of the group by the Mexican Department of Telecommunications for use by U.S. amateurs during the three day period.

The motorcade participants and their families journeyed to Ensenada, Mexica, from various points in Southern California on Friday and Saturday, November 19 and 20, using mobile equipment for caravan communication. The caravan was met at the city limits of Ensenada by Ensenada Radio Club members and a city police escort, complete with red lights and siren. The Mayor of the City, Senor Mendez welcomed the visitors in person at the city hall.

Saturday afternoon the Ensenada Radio Club acted as hosts for a period of fiesta, fun, and contests. This activity took place at El Ciprus, on the military reservation near the city. During the program, XE2DDP, President of the Ensenada Club presented a beautiful statuette to the visiting U.S. Club as a token of the close relationship between the two groups.

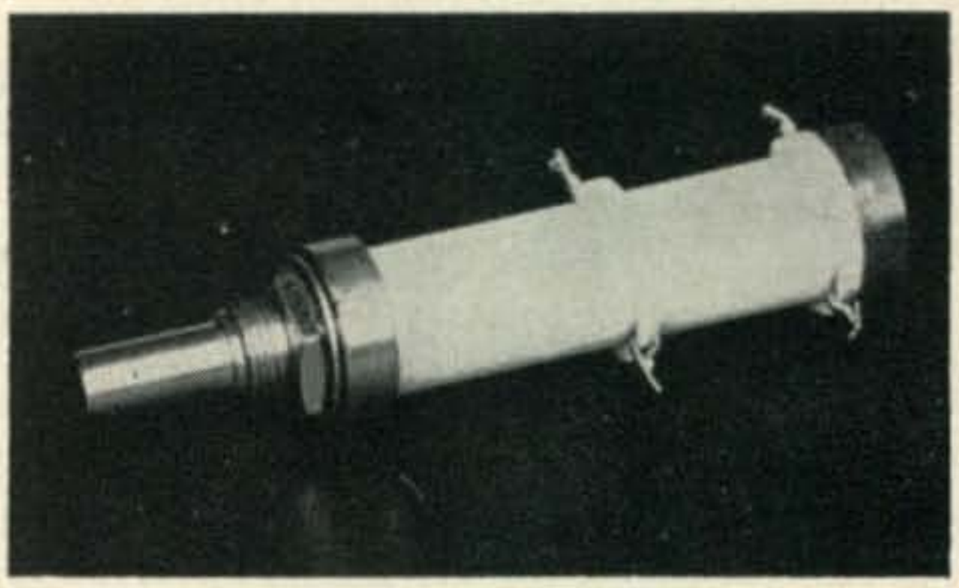
Sunday Morning, Nov. 21, all hands gathered for breakfast at the Vila Marina Hotel. High light of this gathering was presentation by the U.S. group of a large supply of clothing and toys to the local girl's orphanage.

Credit for most of the effort exerted in securing this group of temporary permits must be given to General Alberto Najera, XE1H, General Representative and General Manager and Senor Antonio Cruz-Aribe, XE1BT, respectively, of Association de Radio Aficionados de la Republica Mexicana. These two gentlemen rendered invaluable assistance in their contacts with the Mexican Government Tourism Bureau, State Department, and Department of Telecommunications in Mexico City.

This is the beginning of a new era of international relations and we hope that the practice continues to grow. ■

More On Slug Tuned Coils

BY R. M. BALDWIN,* K4ZQR



Photograph of the Millen No. 69100 knob ceramic coil form.

Described below is a slug tuned coil form designed for panel mounting and knob or dial drive.

In the aricle on slug tuned coils, which appeared in CQ,[1] I referred to the Millen No. 74001 coil form as the "Cadillac" of their line. I didn't know it at the time but they had a "Rolls-Royce" up their sleeves.

I learned of this new development when I sent them a short note of thanks for their help in supplying detailed engineering data on their coils for my previous study. Back came the dope on a brand new coil form, which is so new that the sample I tested as the basis of this article was one of two original models. By now I hope Millen is in full production, because the home brew gang should jump on this one.

Description

The coil is a ½" diameter ceramic slug tuned form with two very unusual properties. Mechanically, it differs from ordinary slug tuned coils in that it may be panel mounted and has a regular ¼" shaft on which you fit an ordinary knob to tune the slug. The knob turns but it does not move in and out as you might expect. Instead, the core travels on an internal spiral gear, and about 25 turns of the knob will move the slug from one end of the form to the other. The second feature is a very high permeability powdered iron core of special formulation which will produce an inductance change of approximately 3.5 to 1 according to the factory specifications when used at the design frequency range.

The standard core is recommended for use at .1 to 1.5 mc, and other core materials for other frequency ranges are to be made available later on special order.

Application

No self-respecting ham wants to spend much time tuning the broadcast band, but if this form has such a terrific frequency range, why wouldn't it work in the 160 meter range as a v.f.o.? One way to find out is to try it, so we wound 80 turns of #32 enameled wire on the form and grid dipped the tuning range with various values of fixed capacity across the coil. This produced the following rough data:

Capacity	Slug Out	Slug in	Range
360 mmf	820 kc	740 kc	80 kc
170 mmf	1300 kc	1100 kc	200 kc
100 mmf	2100 kc	1600 kc	500 kc

This was enough to convince me that it would work on 160 meters without any trouble, but it looked like less inductance was needed so the coil was pruned to 50 turns of #32 and the capacity fixed at 130 mmf. This combination tuned 800 kc from 1700 kc with the slug in to 2500 kc with it out. This produced a change in inductance from approximately 30 μh to 65 μh, and while this was not the 3.5 to 1 range claimed at the design frequency, it more than covered 160 meters, which could be doubled to the 80 meter range. We were in business, or so I thought.

First attempt at actually using the coil in an oscillator circuit involved transistors and it simply would not work. Perhaps someone with better transistors or a better circuit, may come up with a transistorized v.f.o.

At this stage, the simple but effective cathode coupled oscillator circuit of fig. 1 was constructed. A 12AU7 was used, but any twin triode such as a 6SN7 or a 6J6 will work. With a 100 mmf mica capacitor, plus the tube capacity across our 50 turn coil, we obtained the following tuning range:

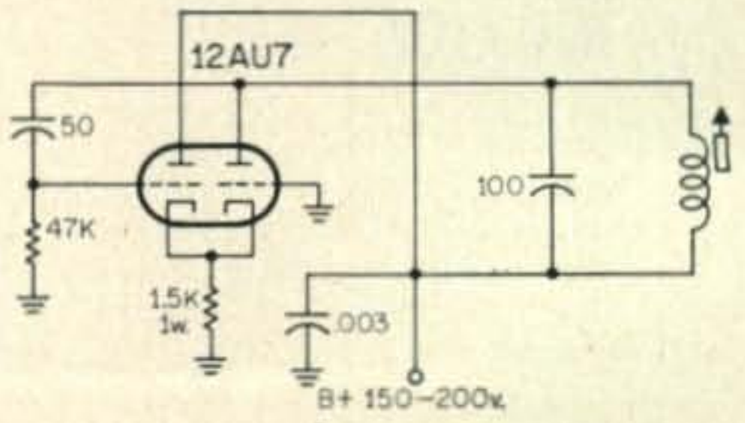


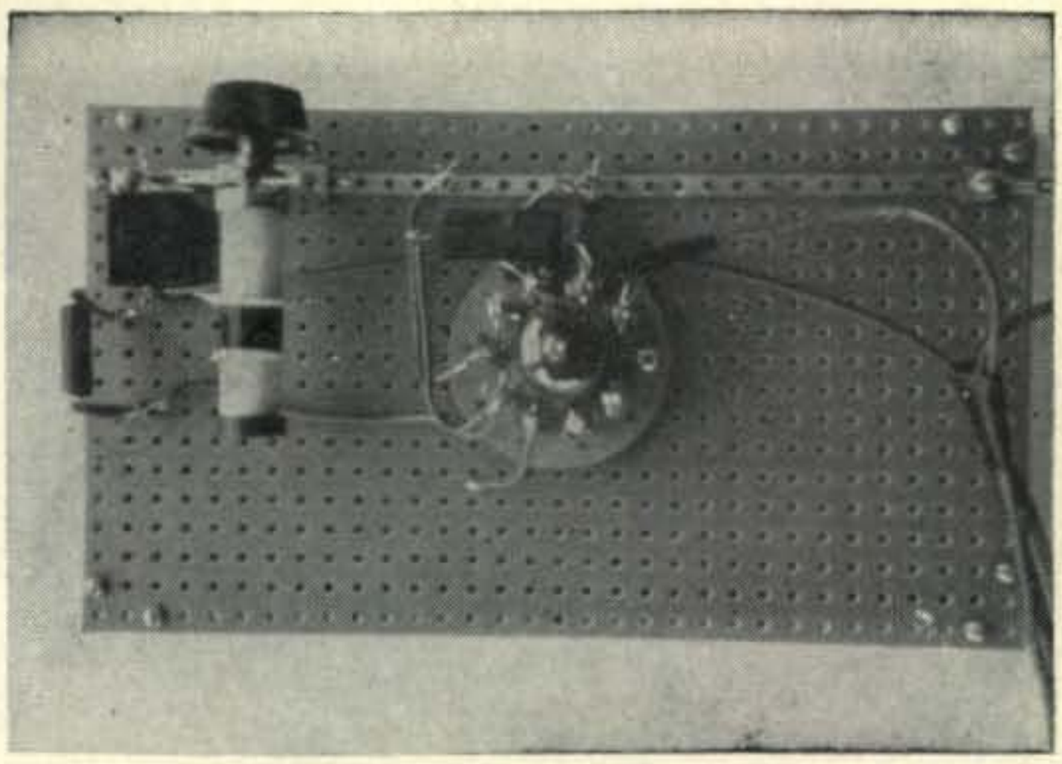
Fig. 1—Circuit of the oscillator used to check out the 69100 coil from for 160 meter operation.

*409 Kaelin Drive, Louisville, Kentucky 40207.

[1]Baldwin, R. M., "Slug Tuned Coils," *CQ*, April 1965, p. 38.

Freq.	Slug Position	Kc per turn
2480 kc	Fully c.w.	
2370	1 turn out	110
2270	2 turns out	100
2170	3	100
2070	4	100
1985	5	85
1950	6	35
1860	7	90
1815	8	45
1775	9	40
1750	10	25
1725	11	25
1710	12	15
1695	13	15
1685	14	10
1682	15	3
1680	16	2
1682	17	2
1685	18	3
1695	19	10
1710	20	15
1725	21	15
1750	22	25
1775	23	25
1815	24	40
	Fully ccw	

Starting with the knob fully clockwise (slug in) there was a very strong clear note at 2480 kc. The lower range petered out at 1680 kc with still a good strong note but only 16 turns out on the slug. Continuing to turn, it was observed that the frequency began to climb back up, and at 24 turns counterclockwise (slug out) it hit 1815 kc. Perhaps different positioning of the coil winding on the form might change the picture a bit, but it is doubtful if the overall range would



View of the experimental set up used to check the Millen 69100 slug tuned coil.

be much different. Here was a practical oscillator circuit tuning from 1680 kc on the bottom to 2480 kc on the top by means of the slug alone—a fantastic range of 800 kc. With a doubler added on, it could easily cover 80 meters plus a few MARS frequencies thrown in for good measure.

The particular oscillator circuit used was simply to try out the tuning range of the coil, but it appeared to be quite stable and tuning with the No. 69100 coil was a pleasure. A picture of the Vector board set up illustrates the simplicity of the layout. Have yourself some fun designing a better circuit, and doubling to 80 meters for a real fine vernier tuning v.f.o. There's no need for a vernier dial with this coil—it's a built-in feature.

Where do you buy it, and what is the price? Well, Millen has put a net price on the coil form of $3.39. At that price, and considering what it your local electronic supply house to get some in stock. ■

New Amateur Product

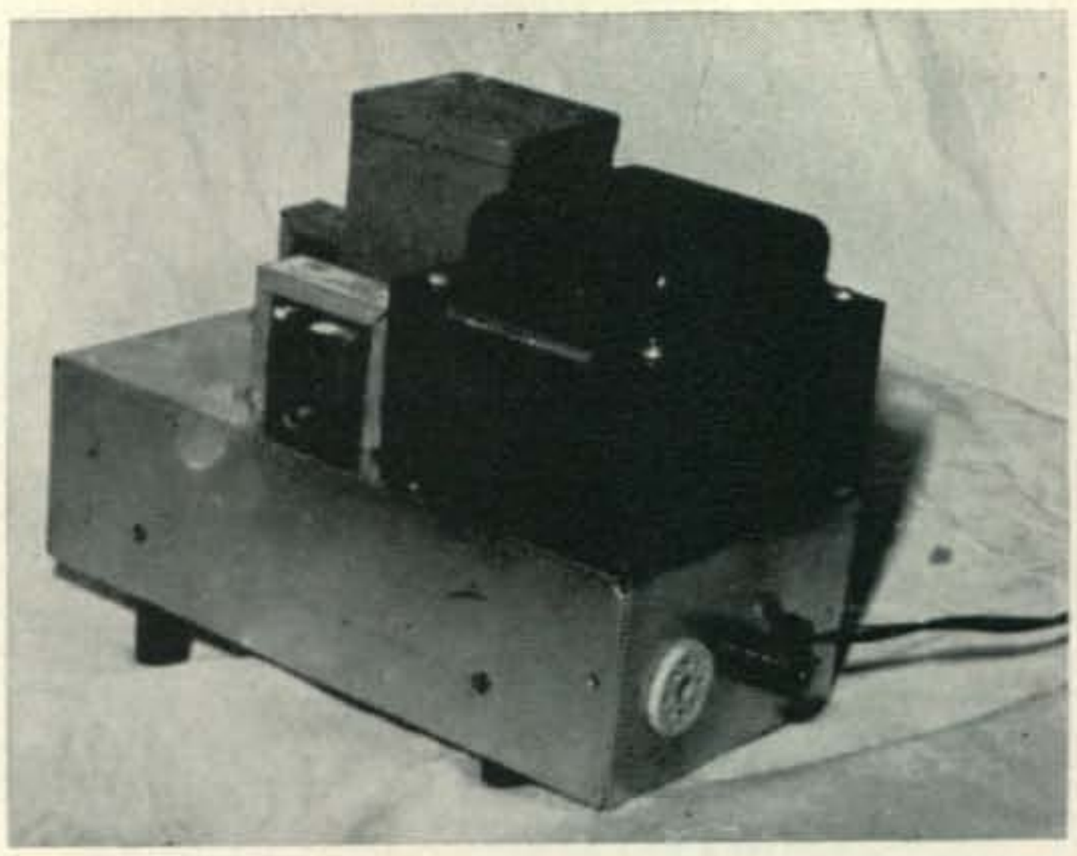
Hallicrafters HT-46 s.s.b. Transmitter

DESIGNED as a companion transmitter to their previously announced SX-146 receiver, the HT-46 provides 180 watts p.e.p. input on 80 through 10. The unit measuring 5⅞" × 13⅛" × 11", features a 9 mc filter, grid block keying for c.w. (150 watts input on c.w.), push-to-talk operation with provision for optional plug-in VOX. The power supply is solid state design and unwanted sideband and carrier suppression are rated at better than 50 db.

Amateur net price of the HT-46 is $349.95. The accessory HA-16 VOX adapter is priced at $37.95. Complete specifications may be obtained by writing to The Hallicrafters Co., 5th & Kostner Avenues, Chicago, Illinois, 60624, or circle 66 on page 110.

Information about products directly advertised or through new product releases can be easily obtained by using the Reader Service Coupon on page 110. Manufacturers welcome any interest in their products.

A Power Supply For The HW Series



View of the power supply without the cover plate. Diode board and capacitors are underneath the chassis.

BY WILLIAM J. RYAN,* WA2DND

THE recent surge of low-cost transceivers and in particular the Heathkit single band variety, has brought out the spending urge in many hams. The HW series (HW-12 for 75, HW-22 for 40, and HW-32 for 20), nicknamed "Hot Water," is particularly appealing to the poor moth-eaten pocketbook. Here is a good fixed or mobile transceiver that does not require a second mortgage on the house.

If you're like so many of us, the initial price tag is a struggle; then comes the added money for an a.c. supply. I bought my HW-12 for mobile, so I acquired a transistor supply (12 volts in, lots of d.c. out). After all of these transactions, there was nothing left for an a.c. supply. The only answer: "Do it yourself."

Sure, I know that by now everyone has built power supplies from old TV transformers, but keep in mind the purpose. This supply had to be compact, provide necessary B plus (high and low), provide 12 volts for filaments and a bias voltage. All this had to be done with economy and neatness.

The basic circuit is a bridge rectifier. If interested in the theory of operation there is plenty of data in the handbooks. This supply is designed specifically for the HW series; however, it has been used with an HX-20, a homebrew W2EWL rig and a homebrew c.w. rig with equal success. For use with some of the more common 100-200 watt p.e.p. rigs, the octal connections need to be matched.

[*Continued on page 99*]

*269 N. Kingsboro Avenue, Gloversville, N.Y. 12078.

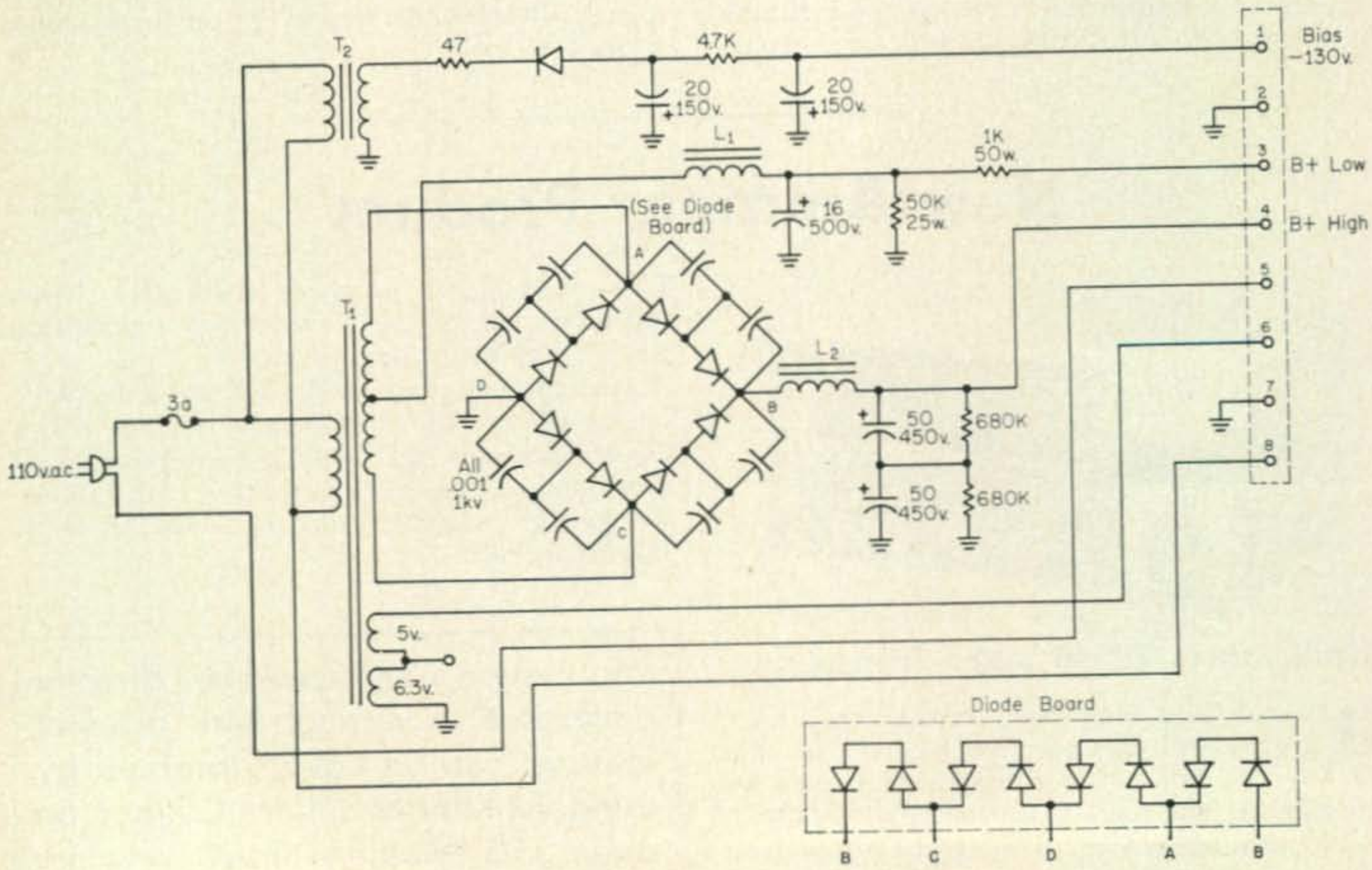


Fig. 1—Circuit of a power supply used to operate the Heathkit HW series of transceivers. Most of the major components are from scrapped TV sets. The parts used are described in the text. The diodes, all 750 ma, 400 p.i.v., are mounted on a board and wired as shown in the insert. All resistors are 1 watt unless otherwise noted.

Using The V.O.M. and The V.T.V.M.

BY WILFRED M. SCHERER,* W2AEF

THIS month we'll talk about handling the v.o.m. and the v.t.v.m. along with some basic procedures for making d.c. voltage measurements and utilizing them for tracking down equipment faults.

Test Leads

Basically, test leads are used to connect the v.o.m. or the v.t.v.m. to the circuit under test. They are very flexible, being made of many strands of fine wire with a pliable outer covering made of high-quality rubber insulation which is rated to withstand 5000 or 10,000 volts and which has dielectric properties that minimize high-resistance leakage effects.

The meter ends of the leads are equipped with suitable plugs that mate with the meter's test terminals. The "working" or "test" end of the leads may have an insulated pin-type prod, or a spring-loaded clip with serrated jaws, such as an alligator clip. The clip is usually covered with an insulated rubber boot. For the v.o.m., the negative or common lead is colored black; the positive one is red.

Rapid readings may be made with test prod-type leads, because they may be quickly moved from point to point, and its length and slender shape permits easy access to hard-to-reach points in crowded quarters.

Clip-type leads may be fastened directly to the circuit under test, so that readings may be made as the equipment heats up with power applied (this often provides a clue to trouble) or so that readings may be watched while adjustments are made to the equipment. Clip leads sometimes are used like a prod to make momentary contact on hot circuits, but due to the shape of the clip, it may not always be conveniently or safely used in tight places.[1]

With the v.t.v.m. a black clip lead usually is supplied for the common or ground connection and the prod-type is used for d.c. and a.c./ohms leads. The v.t.v.m. d.c. prod uses a flexible shielded lead and has a 1 megohm resistor in the prod handle connected between the lead and the contact tip. The resistor acts like a choke to isolate the lead and v.t.v.m. from the test circuit.

Range Calibrations and Accuracy

The positions of the range-selector switch are marked to coincide with the scale calibrations on the meter face, or with a multiple thereof. Before using the instrument, it might be well to study these relationships and become familiar with reading the scales, so that values may be quickly and conveniently ascertained with the least possibility of error. Sample scales were shown in previous articles.

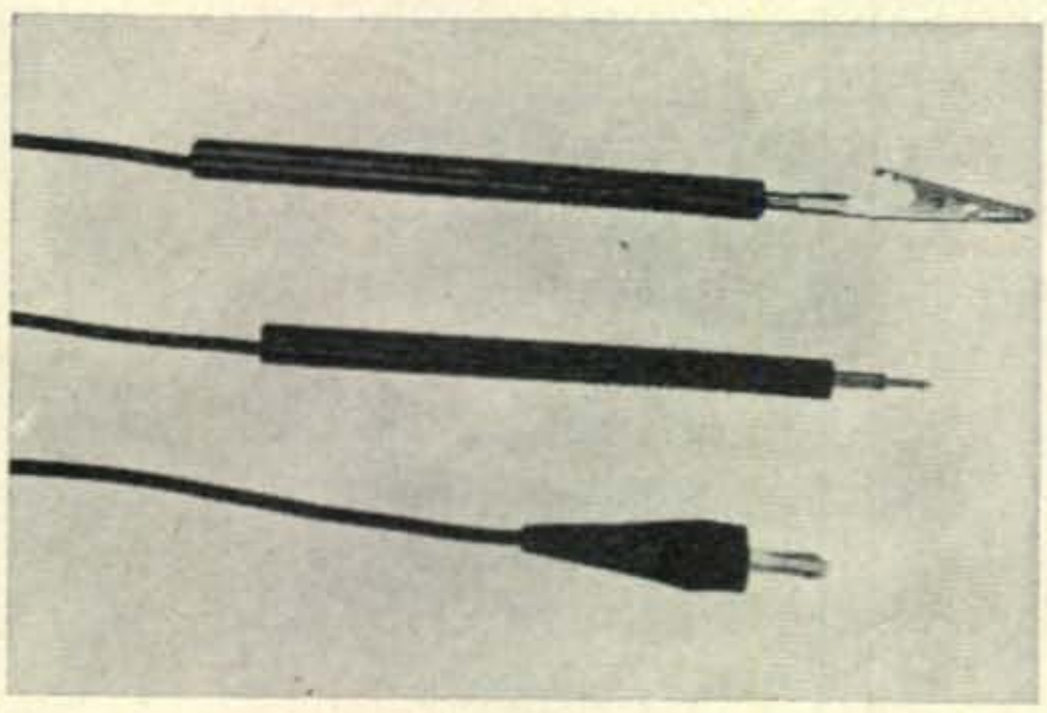
Specific details on reading the scales of a particular instrument usually are given in the manual supplied with the meter, so they will not be described here; nevertheless, we will take a look at the accuracy of readings.

The accuracy of voltages measurements is given as plus or minus a certain percentage of full-scale reading. This means that the maximum possible error of a reading *anywhere* on the scale is the stated percentage *times* the *full-scale* calibration of the range used.

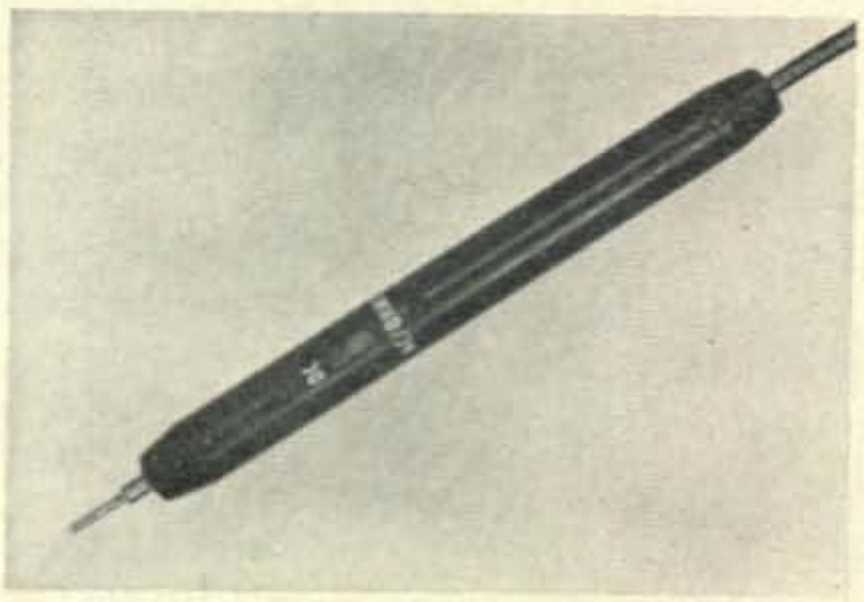
For instance: With a $\pm 2\%$ full-scale rating, the accuracy on a 100-volt range would be $\pm 2\% \times 100$ volts or ± 2 volts at *all* points

*Technical Director, *CQ*.

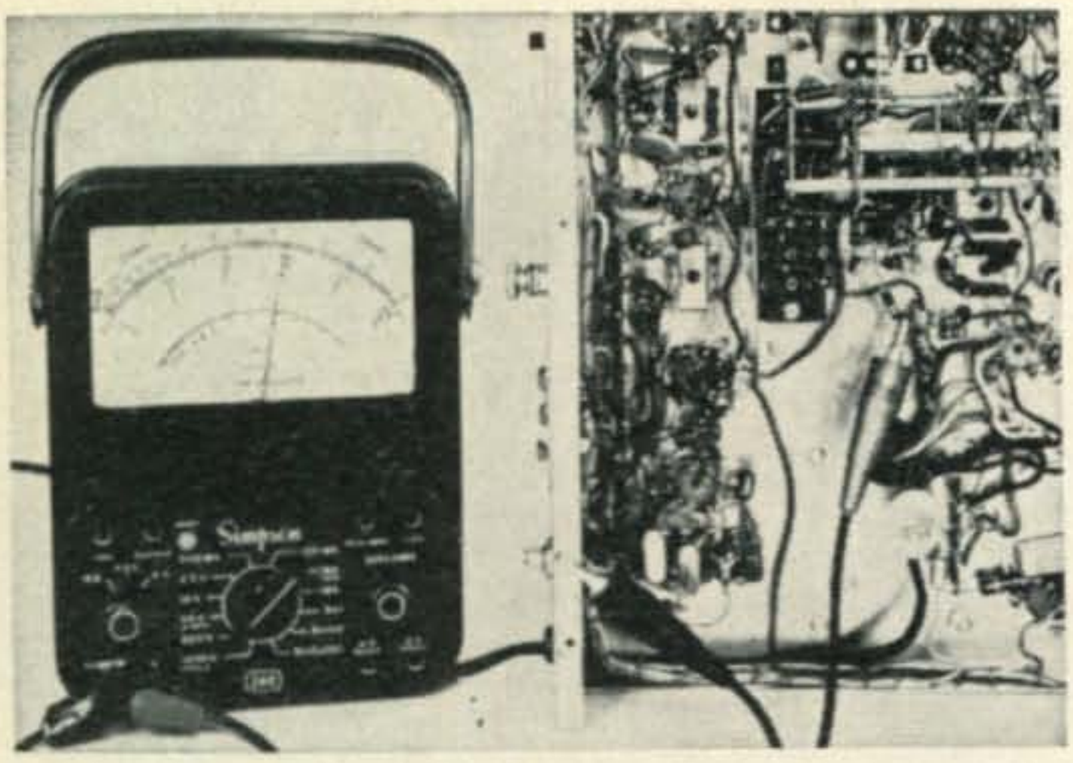
[1]If you do not have a prod-equipped lead available, one can be improvised by attaching a clip lead to the metal shaft of a long and slender screw driver that has an insulated handle by which the implement may be held while the metal end is used for the prod.



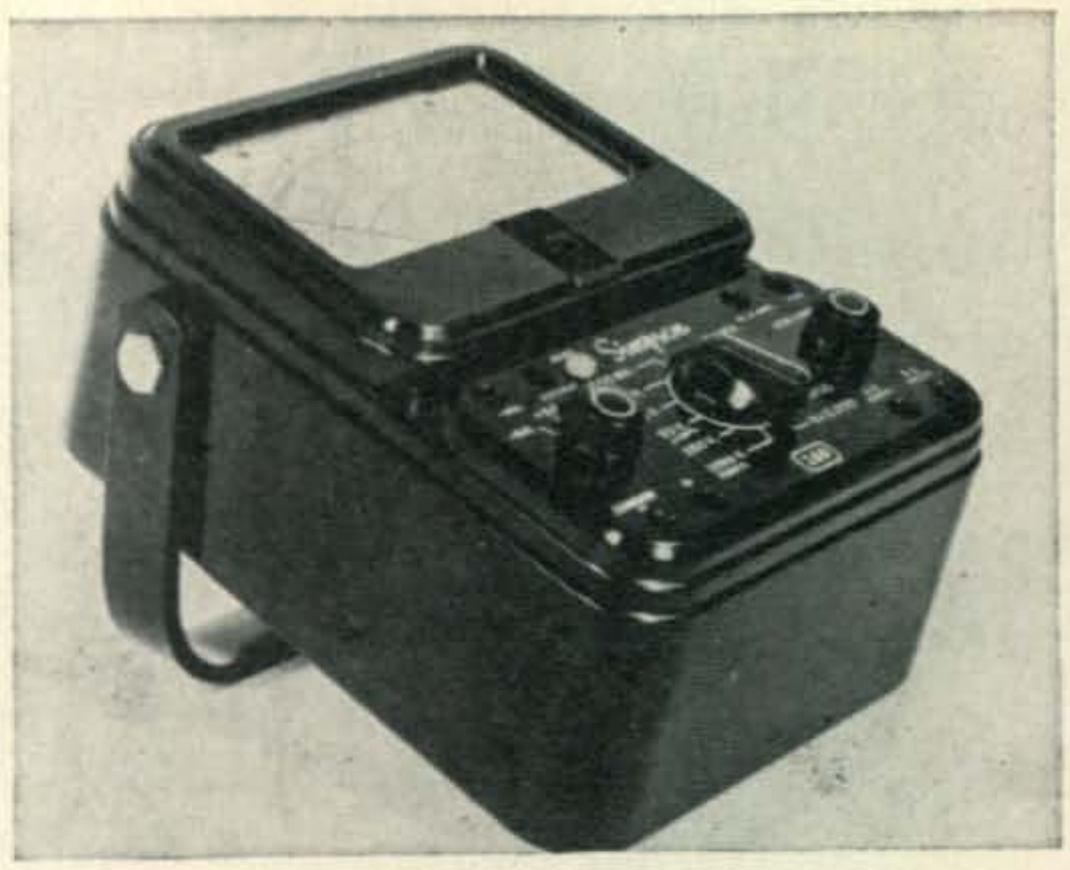
Test Leads. At bottom, a clip type; at center, a prod type; at top, a prod with a clip slipped on to it for use as a clip lead. The clip would be best used for safety with a boot installed over it.



A multi-purpose probe with a built-in switch to allow d.c. or a.c./ohms measurements to be made with a v.t.v.m. using the same test lead.



Clip leads shown attached to equipment under test. The negative or ground lead for the voltmeter is fastened to the chassis at the left. The positive lead at the right is clipped to a high-voltage point on a resistor lead.



The handle of a v.o.m. shown used as a back-rest to support the meter at a tilted-up angle.

along the scale. If a measurement is made across a 10-volt circuit using the 100 volt range, the maximum possible error will result in a reading of 8 or 12 volts and the error actually will amount to 20% at this point. If this same voltage were measured using a 0-10 volt range with the same meter, the maximum error would be only ±0.2 volts (2% × 10 v.). Thus, greatest accuracy is obtained when a range is used where the meter reading is near the high end of the scale.

The accuracy of resistance readings is given as a specific percentage of the linear scale or scale length, which usually boils down to a percentage of the actual value. In operation, the best accuracy is realized along the center portion of the ohms scale.

Preliminary Steps and Precautions

Before using either a v.o.m. or v.t.v.m., see that the meter pointer is lined up with the zero mark at the start of the scale. If need be, it can be adjusted so with the zero-set control, a small screw located at the center near the lower edge of the meter case. When properly set, the pointer should remain at zero regardless of the position in which the meter is placed; however, after hard usage and abuse, this may not be the case and it will then be necessary to reset it for different positions.

When preparing to make measurements, be sure the instrument is on solid footing away from the edge of the bench to prevent accidentally knocking it over. A v.t.v.m. generally is placed upright, while the v.o.m. may be set vertically or horizontally. If the meter has a rigid-type swinging handle, it may be positioned to serve as a back rest to tilt the meter up at a slight angle for easy reading. In some cases the meter may be hung from a solid support or be suspended by a gimbal mount as shown in the photos.

Handling

Never use a v.t.v.m. while it is standing on a metal bench, radiator or other grounded surface. When handling test leads or manipulating instrument controls, avoid bodily contact with the equipment chassis and a v.t.v.m. case or panel.[2] In any case, stand on a well insulated surface and use only one hand at a time, keeping the other hand in your pocket. Grasp the test lead at its insulated handle and well back from its exposed metal tip.

The equipment power should preferably be turned off and filter capacitors discharged before leads are connected, especially if they are to be clipped to the circuit. This is desireable even if the clips have insulated boots, because accidental hand contact with hot circuits may occur in tight spots, or a temporary short could take place to adjacent circuits while the clip is being attached.

If it should be necessary to leave the power on, connect one lead at a time, first the common or ground lead and then the hot one. When leads are removed, disconnect the hot one first, remove the grounded one last.

Whe the common lead is to be grounded and one or more hot points are to be checked by momentary contact with a prod, use a clip lead for the common one and securely fasten it to the chassis ground (this will allow you to keep one hand away from the equipment). Even

[2]Keep in mind than even if you're using a v.t.v.m. with a plastic case, on some models the metal panel is grounded by a third pin on the a.c. power plug or the common test lead is likewise grounded. Also, the metal shell of the screw-on connector for the hot d.c./a.c. test lead generally is grounded too. While such grounding may be beneficial in some instances, in other cases it may actually present a hazard. Check your instrument, so you are familiar with what is or is not grounded.

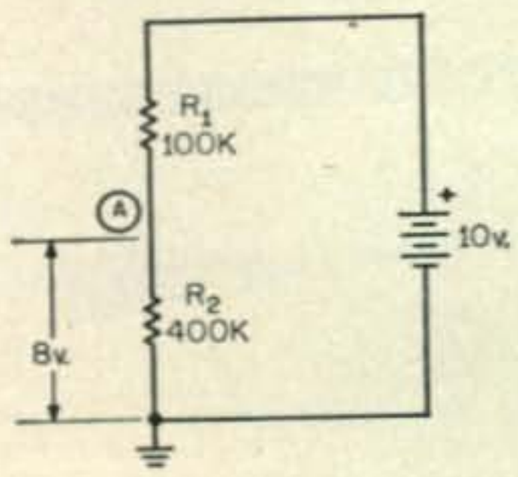


Fig. 1—A high-resistance circuit on which the effects of circuit-loading by a voltmeter are discussed in the text.

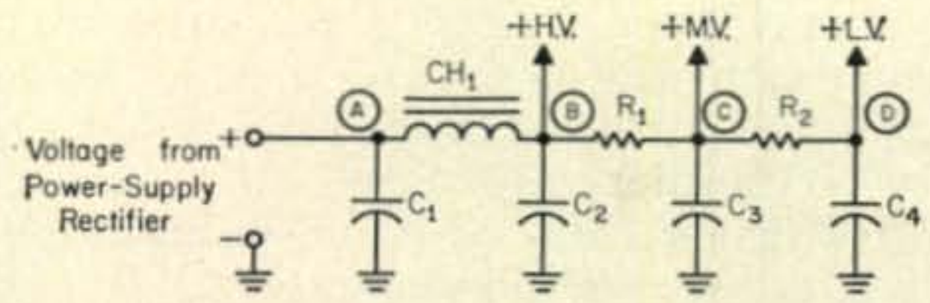


Fig. 2—Procedures for using voltage measurements to track down equipment failure in connection with the above circuits. Measurements should be made between ground and the point in question in the order given; and in each case it is assumed that the reading of the previous step was normal.

1—No voltage at A: Due to C_1 or C_2 shorted, short on h.v. B-plus line, ground in CH_1. NOTE: If a fuse is included in the power source, it should blow out under these conditions.

2—Low voltage at A: Due to C_1 leaky or one of the causes in step 5.

3—High voltage A: Due to loss of load due to CH_1 open or one of causes in step 6.

4—No voltage at B: Due to CH_1 open, C_2 shorted.

5—Low voltage at B: Due to excessive current drawn by load on B-plus lines, C_3 or C_4 shorted, C_2 leaky.

6—High voltage at B: Due to loss of load or low current drawn by m.v. or h.v. B-plus lines, R_2 open.

7—No voltage at C: Due to R_1 open, C_3 shorted, short on m.v. B-plus line.

8—Low voltage at C: Due to high resistance at R_1, excessive current drawn by l.v. and m.v. lines, C_4 shorted.

9—High voltage at C: Due to low resistance at R_1, loss or decrease of load on l.v. and m.v. lines, R_2 open.

10—No voltage at D: Due to R_2 open, C_4 shorted or short on l.v. B-plus line.

11—Low voltage at D: Due to higher resistance at R_2, excessive load current on l.v. line.

12—High voltage at D: Due to lower resistance at R_2, decrease or loss of load on l.v. line.

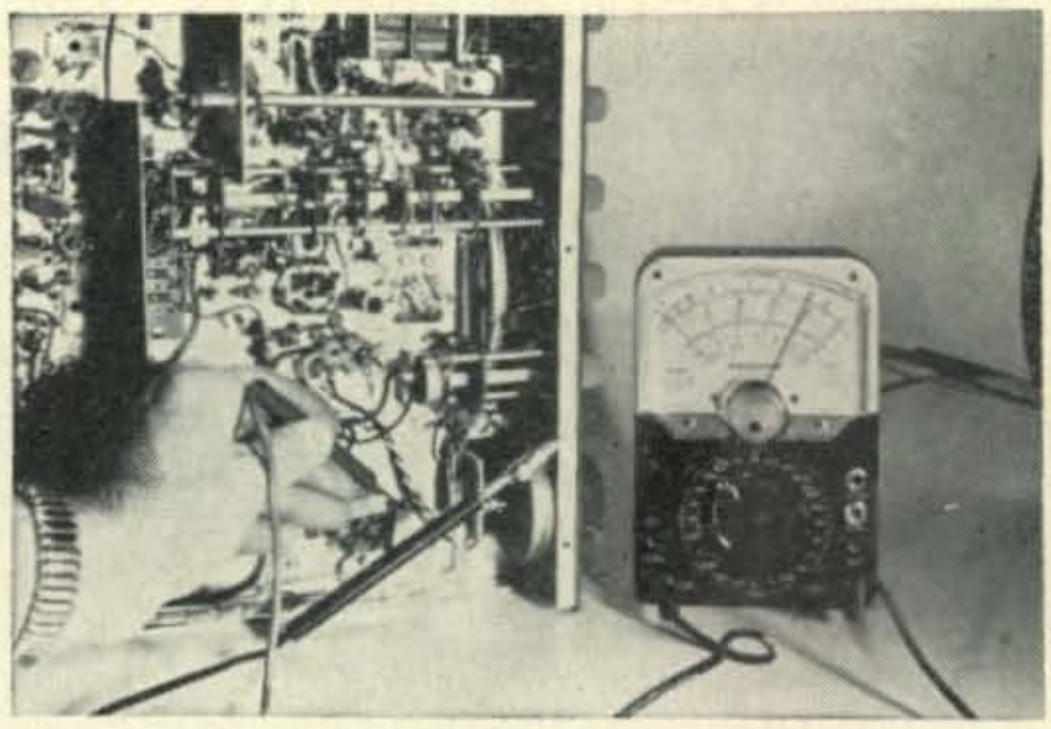
though this is a ground lead, it should have an insulated boot to prevent personal shock if the lead should be removed by hand before the hot lead is disconnected.

A voltage will appear on the case or panel of a v.t.v.m. through the common lead when the meter is used where both sides of the test circuit are above ground. Therefore, connect the common lead to the side of the circuit that is expected to be at the lowest potential above ground. Special consideration also must be given if you're using a plastic-enclosed v.t.v.m., because of the inherent grounding system described in footnote 2. If the equipment under test happens to be grounded, attempt at measurements with one of these instruments may produce a short across a portion of the circuit.

Where instrument jacks are used for changing functions or ranges, do not switch connections without either first shutting off the equipment power or removing the other end of the leads from the equipment under test. Remember, the instrument end of a lead may otherwise have high voltage present on it.

D.C. Voltage Measurements

D.c. voltages are measured by connecting the voltmeter across the source to be tested. The negative lead of the meter should be connected to the *minus* side of the circuit, while the positive



A prod-type test lead held by hand while checking voltage on a piece of gear. The negative lead is clipped to the chassis for a ground.

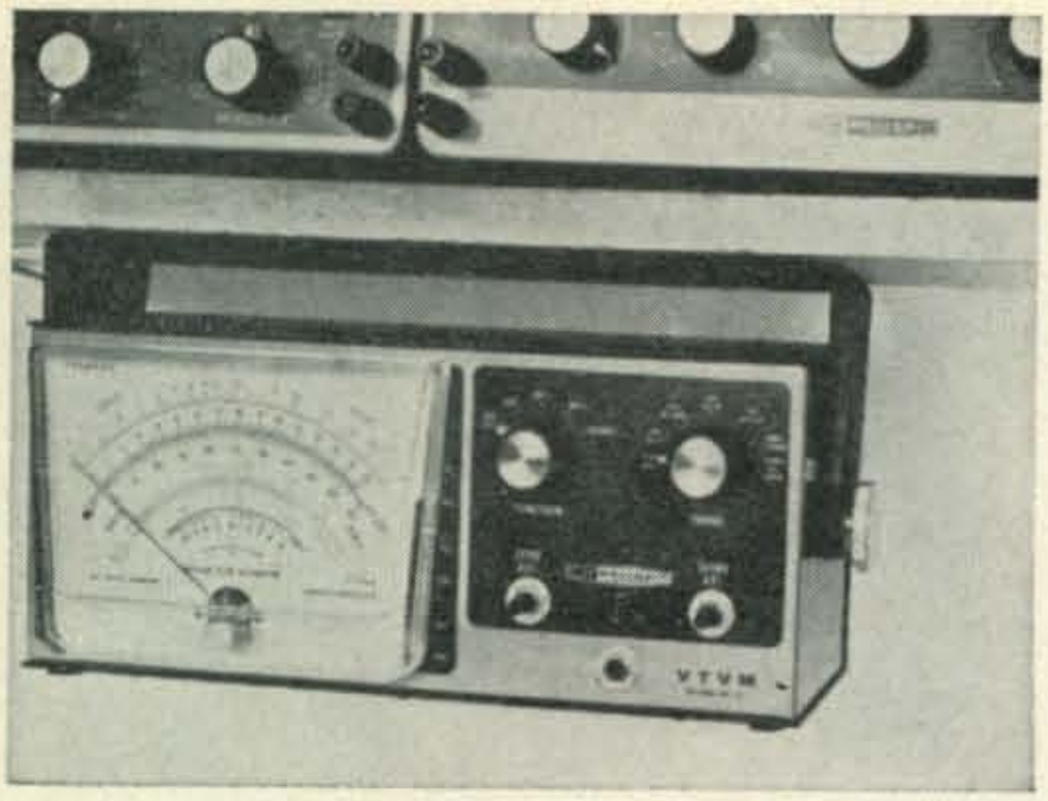
lead should go the the *plus* side. If the polarity of the source is in doubt, first tap one side of the circuit momentarily with a prod and note if the meter swings in the correct direction. If not, reverse the test leads or use the polarity-reversing switch on the meter.

As a precaution, readings should be started using a higher-than-needed range and ending up with a lower range that provides the best accuracy. Consideration also must be given to ohms-per-volt rating of the meter compared with the resistance of the circuit under test.

Importance of Ohms-Per-Volt

Let us now see how the meter resistance can affect the voltage at high resistance points. Referring to fig. 1, R_1 and R_2 comprise a voltage divider across a 10-volt source. The value of R_2 is eight-tenths the total resistance of R_1+R_2, so the potential between ground and point A is 8 volts. If a 1000 ohms per volt 0-10 volt meter is used to measure the voltage at A, the meter resistance of 10,000 ohms (10v. × 1000 ohms per volt) will appear across R_2, lowering the total circuit resistance and causing more current to flow through R_1. This in turn causes the voltage drop across R_1 to increase and thereby lower the voltage at A. Calculations by Ohm's Law will show that the potential at A will be only 0.9 volts instead of the original 8 volts.

A typical v.t.v.m.



A v.t.v.m. suspended from a shelf by a gimbal mount.

Further calculations will show that if the meter were switched to a 0-50 volt range, the meter resistance would be 50,000 ohms and the potential at A would turn out to be 3 volts. Using a 0-10 volt range of a *20,000* ohms per volt meter, 5.7 volts would appear at A, while 7.4 volts would be found using its 0-50 volt range.

On the other hand, a v.t.v.m. with an 11 megohm input resistance on all ranges would only slightly reduce the potential to 7.98 volts. In addition, the voltage could be read more accurately, because a low range could be used (without loading the circuit) where the meter pointer swings well up the scale. Although our example is quite exaggerated, it has been selected to more fully demonstrate the effects of "circuit loading" by a voltmeter.

In practice, high-resistance circuits are apt to be encountered at the plate of a resistance-coupled tube, a tube grid or screen, *R/C* filters, a.g.c. systems and the like. Under these conditions it always will be best to use a voltmeter having as high a resistance as possible, or by using it on its highest range, consistent with obtaining a useable reading. Where the determination of actual voltage is not required, a low-resistance meter will be useful, but only for indicating whether or not the circuit is functioning at all.

Checking Equipment

To facilitate maintenance and servicing, the operating manuals for amateur gear usually include data on the normal voltages required at various parts of the circuitry. The indicated values are those measured between a given spot and a reference point, generally the chassis ground. In case of equipment failure, incorrect voltages, may serve as a clue to the cause of a defect.

The ohms-per-volt sensitivity of the meter which was used to obtain these reference voltages is usually given; otherwise the readings on resistance-sensitive portions of the gear may be lower or higher than those specified, because of the difference in circuit loading as we just discussed.

Procedures

It is impossible at this time to outline all the procedures for tracking down equipment failures by means of d.c. voltage measurements, but the steps below should serve as a basic approach.

Assuming that the high-voltage power supply itself is functioning properly, the following incorrect readings may be due to one of the following principle causes in each case:

1. No Voltage: Short is present in the load or the voltage-supply line is open.

2. Too Low Voltage: Excessive current draw by load, increased resistance in supply line.

3. Too High Voltage: Lower than normal current drawn by load, load circuit open, or lowered resistance in supply line.

Examples of such situations may be found in connection with the B-plus voltage distribution network at fig. 2. Some typical symptoms and possible other causes of trouble in a vacuum-tube amplifier are explained at fig. 3.

A discussion of other measurements made with the v.o.m. and v.t.v.m. will be presented in a subsequent article in this series. ■

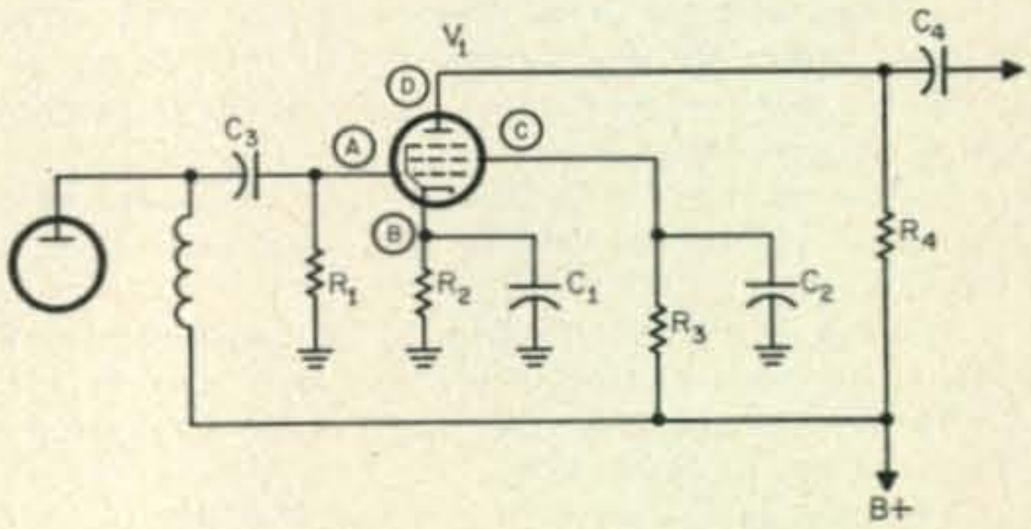


Fig. 3—Some typical symptoms and causes of trouble in a vacuum-tube amplifier. Readings at point B are indicative of the bias voltage developed across R_2.

1—No voltage at B: Due to C_1 shorted, no screen or plate voltage on V_1, no current drawn by tube due to defective tube, no heater voltage or no screen and plate voltage.

2—Low voltage at B: Due to increased resistance at R_2, decrease in screen and plate voltage, bad tube.

3—High voltage at B: Due to increased resistance at R_2 or increase in screen and plate voltage.

4—No voltage at C: Due to C_2 shorted, R_3 open.

5—Low voltage at C: Due to C_2 defective, increased resistance at R_3, wrong bias.

6—High voltage at C: Due to increased resistance at R_2, wrong bias.

7—No voltage at B: Due to R_4 open.

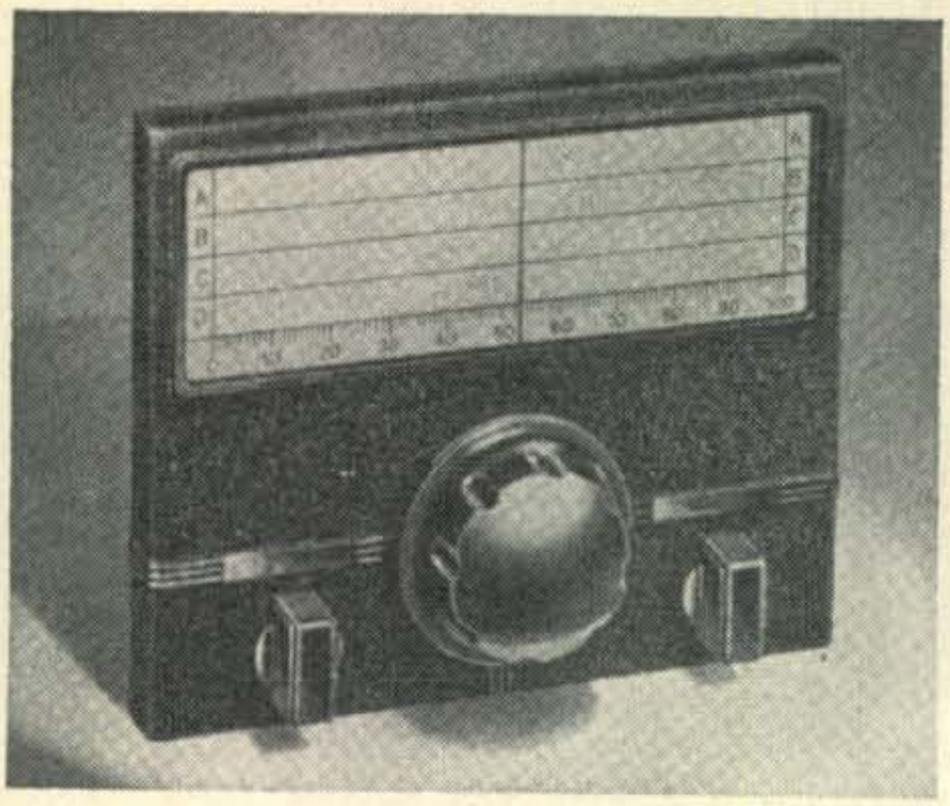
8—Low voltage at D: Due to increased resistance at R_4, high tube current because of low bias due to change in R_2, R_1 open.

9—High voltage at D: Due to decreased resistance at R_4, low tube current because of high bias due to change in R_2.

10—Positive voltage at A: Due to C_3 defective.

BY THE WAY...

March marks the beginning of George Jacobs 16th year as Editor of our Propagation Column.



ADDING ZERO SET TO MILLEN DIALS

BY H. E. PARSONS,* VE3QA

THE ever growing popularity of s.s.b. has made it more necessary than ever to have accurate frequency calibration on the transmitter v.f.o. Assuming that the calibration of the dial on a "home brew" transmitter has been carried out accurately in the first place the lack of a means of zero setting on most commercially available dials in the past has made it hard to compensate for initial warm up, drift, *etc.*

I noted with interest the review in *CQ*[1] of a new Millen dial which does have this almost essential feature. The older Millen dial was not so equipped and, as there are undoubtedly many of these dials about, it was thought that the following description of modifications made to this dial (Millen 10035) some two years ago to provide this feature might be of interest.

Examination of the dial showed very little room was available for any additional mechanism. Also it was desired to keep clear of the two positions available for auxiliary controls provided in this dial. Various schemes of cams, cables, *etc.* were considered and the mechanism shown was finally evolved. This provides for moving the whole Millen scale horizontally ±⅛" relative to the cursor.

Construction

The two photographs show the general scheme. In both of these, the front cover has been removed as has also the plastic dial together with the 8" × 2½" metal dial holding plate and cursor slide to show the new mechanism which is all behind this item.

First the small lips at each end of the dial holding plate which retain the plastic dial are cut off and discarded together with the associated flat spring. With the lips removed the plastic dial scale is free to slide sideways relative to the cursor. In fact at this stage it can slide right out if the front cover is not in place. In the revised scheme the dial will be retained by a new piece, the zero set plate "A" in fig. 1. This consists of a flat strap of 16 gauge (0.062") brass 11/16" wide by 7⅛" long over its main part with two ⅛" wide by ¾" long extensions out, one from each end, in line with the lower edge. The outer half inch of each of these extensions is turned up to form horns which engage with the ends of the plastic dial. Part A is detailed in fig. 2(A).

This new piece is located behind the slide plate and is held to the main back plate of the Millen dial by two shoulder pins "B", operating in small slots near each end of the new "zero set" slide. These slots are 3/16" wide by 7/16" long over their rounded ends. With 3/16" diameter shoulders on the two locating pins this means that the new "zero set" slide is free to move sideways plus or minus ⅛". It will be necessary to cut a little off the lower edge of the two bent up brackets located at each side of the main back plate and which support the dial mounting plate and also two small notches in this plate so that the horns on the new zero set plate are free to slide the ±⅛" and thus move the dial this amount relative to the cursor.

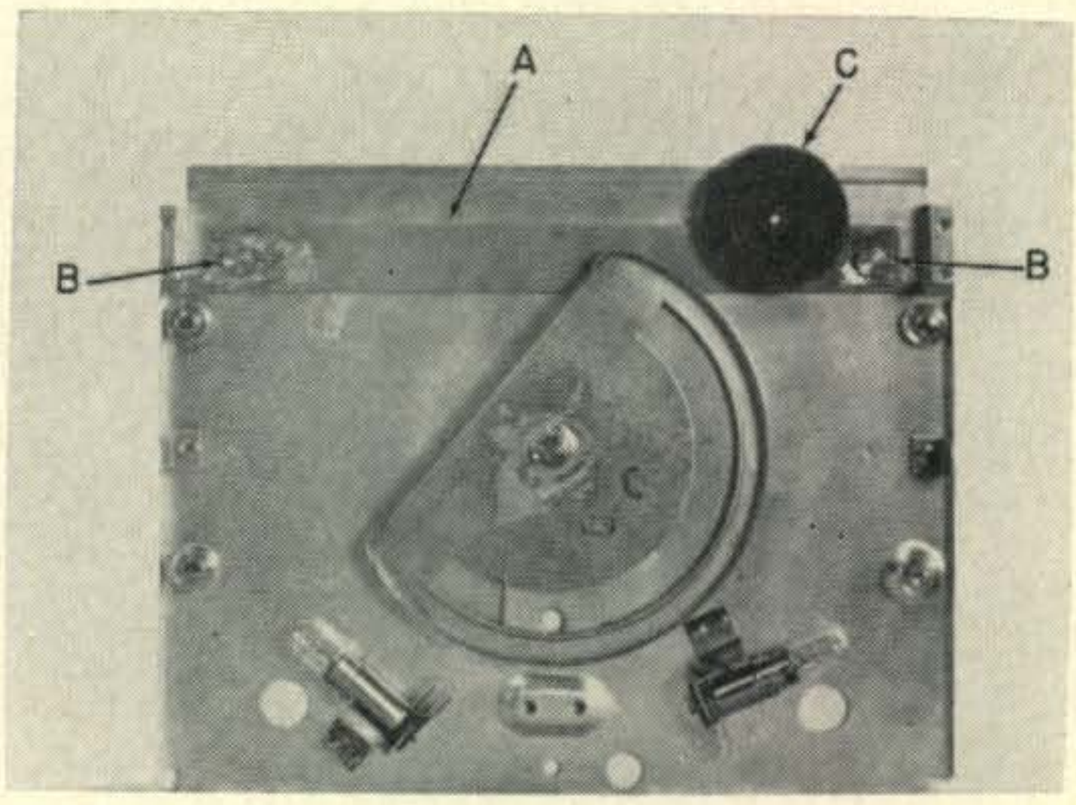


Fig. 1—Photograph of the rear plate with cover and dial removed. The slide, A, is detailed in fig. 2(A) and the thumbwheel is shown in 2(B).

*R.R. 3, Metcalfe, Ontario, Canada.

[1]"New Components by Millen Mfg.," *CQ*, June 1965, p. 55.

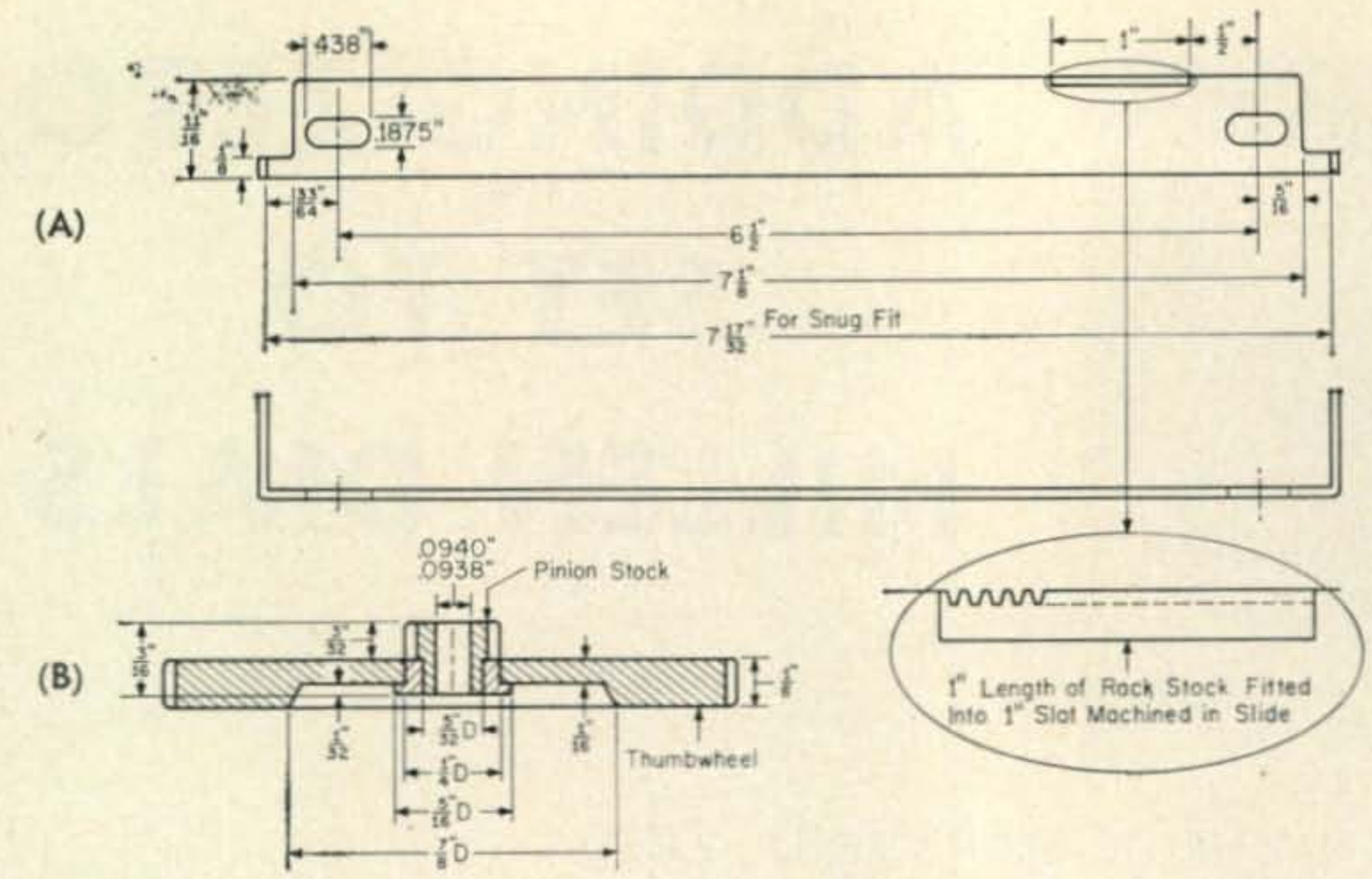


Fig. 2(A)—Details of the zero set plate, A, of fig 1 (B) Details of the thumbwheel, part C of fig. 1. The gear may be a Boston Gear #Y6496 with the hub removed and machined as shown. The pinion stock is YW5 G414 and is press fit in the gear.

The actual position of the zero set slide is controlled by means of the zero setting control "C" (fig. 1). This is made up from any available 1½" diameter gear or disc used as a thumb wheel and mounted on a small piece of pinion wire. The whole assembly turns on a small stub shaft "D" soldered to the Millen back plate. The pinion wire engages a small piece of rack soldered into the top edge of the zero set slide. This can be clearly seen, as can also the stub shaft, in fig. 3, without the thumb wheel. A small piece is cut out of the top edge of the Millen front cover to clear the thumb wheel. With the small number of teeth required, the teeth could probably be filed directly into the zero set slide with sufficient accuracy, thus avoiding the need for the piece of rack material. Any surplus 1½" diameter gear or a knurled bakelite disc would do for the thumb wheel. An old spring type alarm clock could provide both this and the pinion. A sketch of the thumbwheel is shown in fig. 2(B).

The ability to set the scale right on the nose is certainly a very considerable advantage, especially when chasing rare and exotic DX which, in addition to the design of equipment, is the writers main interest. ■

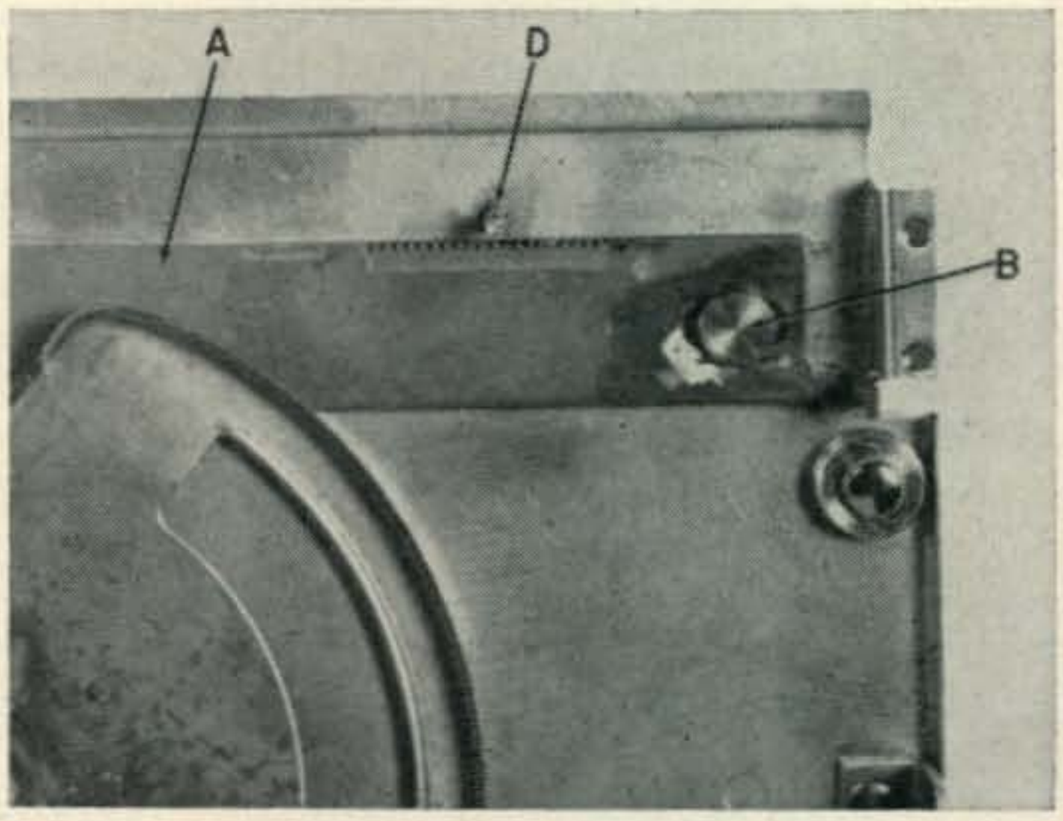


Fig. 3—Close up view of the rack, wheel pivot and slide shoulder pins.

New Amateur Product

Bud Type Cleaner Co.

A non-liquid cleaner for teletypewriter keys has been introduced by Bud Type Cleaner Co. The Bud type cleaner employs a wad of pink plastic putty attached to a convenient patented handle. The putty pulls the dirt out of the type instead of washing it into the machine and leaves no residue. After use, the putty is remolded by hand to provide a new clean surface. The type cleaner can be used to clean numerous machines before the putty becomes purple and should be discarded. The ink will not come off on the hands, if used as directed. Less than one minute is required to clean the keys of a teletypewriter. No brushing or liquid is required. The Bud type cleaner is priced at 50¢. For further information write to Bud Type Cleaner Company, 1931 Green Spring Dr., Timonium, Maryland 21093 or circle 68 on page 110.

Front view of the tuning aid. The resonance indicator occupies the upper part of the panel with the Q multiplier below it.

An Advanced Tuning Aid

BY RONALD L. IVES

This tuning aid combines a Q multiplier and resonance indicator in a single package. Its use can raise the performance of inexpensive receivers to an acceptable level.

DESPITE the high sensitivity and selectivity of our better communications receivers, getting a clean specific signal out of some of our cluttered bands is still a problem. With a crude and/or inexpensive receiver, almost any adjunct, assembled from the junk box, will bring about some improvement. With receivers like the 75A-4 and the GPR-90, which already have both maximum usable sensitivity and adequate selectivity (controlable) for almost any situation, only a few adjuncts can improve reception, and these must be most carefully designed.

The most common need, under difficult conditions, is for a second crystal filter, or its equivalent, to eliminate the heterodyne that somehow always seems to get into the better sideband of the wanted signal. This need is met by the Villard Q-Multiplier,[1] which is just as useful with a good receiver as with a klunker.

A second recurrent need is for a tuning indicator considerably more sensitive than the conventional S-meter. This is particularly useful when copying phone signals in unfamiliar languages, or when the transmission is in "English," with a Burmese accent. Intelligibility is usually greatly improved when the signal is *exactly* centered in the receiver passband. This need is met by the resonance indicator,[2] which is essentially an indicating discriminator.

Following extensive testing, these two devices were built as a single outboard unit, with an integral power supply. The resultant tuning aid has now been in service for more than 6,000 hours, needing only occasional replacement of indicator lights, and retubing after 5,000 hours during that time. The tuning aid will probably become obsolete (in ten or fifteen years) before any major overhaul is needed.

Construction

The tuning aid uses an 8¼" × 8¾" panel and a 7" × 14" chassis. The exact dimensions aren't important, but it is essential that the panel-chassis combination be mechanically rigid.

Q Multiplier

The circuit of the Q multiplier, shown in fig. 1, is similar to Villard's and operates in exactly the same way. For satisfactory performance better grade components must be used throughout but only a few of these are *really* critical. These are the frequency determining components, C_1, C_2 and L_1 and L_2. The fixed value frequency determining capacitors should be mica or silver mica.

The tuning capacitor used is coupled to a 5:1 planetary drive, which supplies a satisfactory tuning rate. The variable capacitor and the planetary drive are mounted together on a bakelite disk with the aid of some spacers, and the whole subassembly, after careful adjustment for smooth operation, is mounted on the panel.

Resistive controls for PEAK HEIGHT and NULL DEPTH must be stepless, stable and smooth-working. Ohmite type CU pots, or equivalents, have been found entirely satisfactory.

The Q multiplier functions are selected by use of a four-pole, three-position lever switch (Mallory 6243).

Resonance Indicator

The resonance indicator, occupying the upper part of the panel and sharing the rear under-chassis compartment with parts of the power

*2075 Harvard Street, Palo Alto, California.

[1]Villard, O. G. Jr., and Riordan, W. L. "Flexible Selectivity for Communications Receivers," *Electronics*, Vol. 25, No. 4, April, 1952, pgs. 148-150.

[2]Ives, R. L., "Hypersensitive Resonance Indicator," *Electronics*, Vol. 23, No. 8, August, 1950, pg. 118.

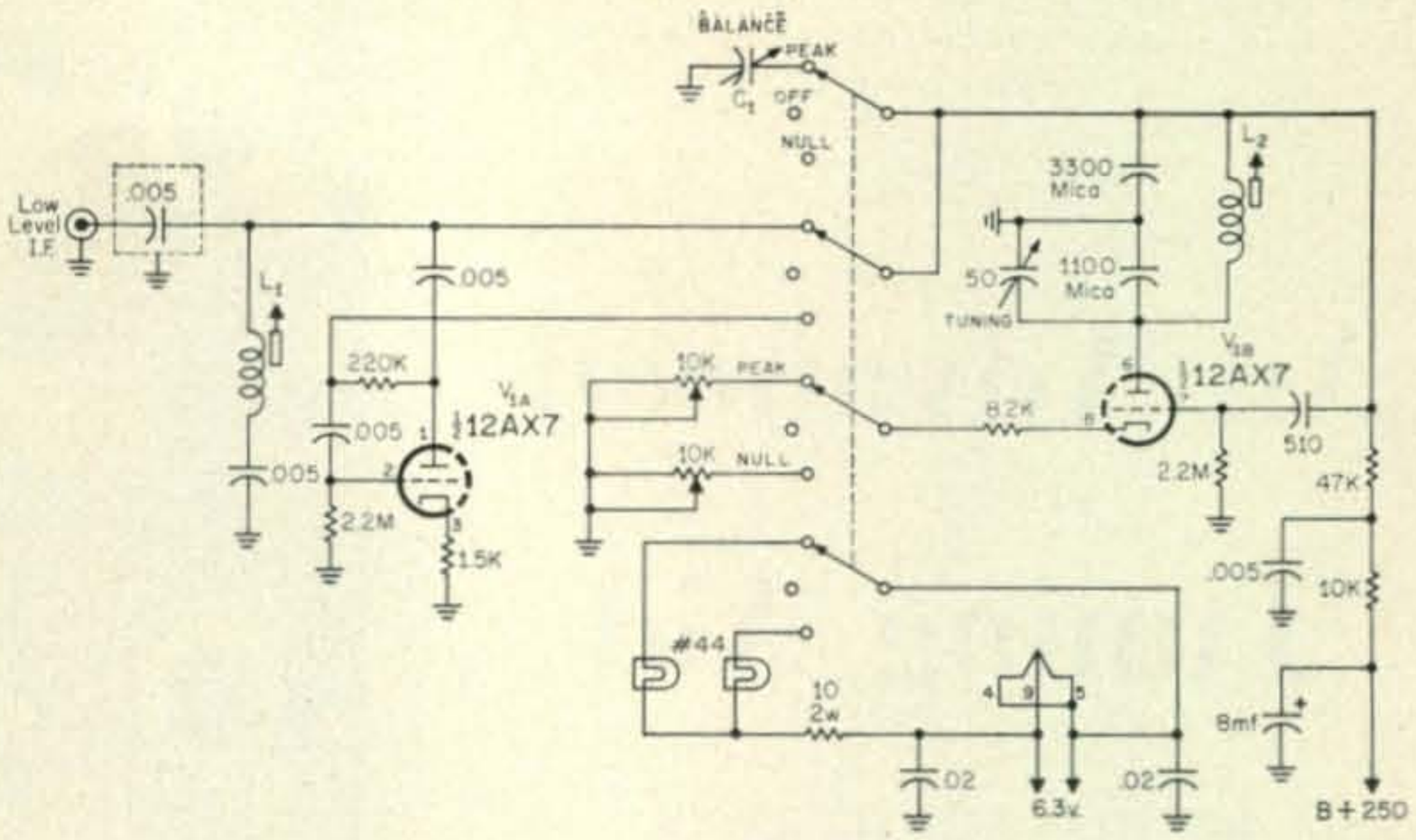


Fig. 1—Circuit of the Q multiplier portion of the tuning aid. The shielding and isolation methods are extremely important as explained in the text.

C_1—1-10 mmf.
C_2—4-50 mmf. Hammarlund HFA-50B or equiv.
L_1—Line coil—1.5 to 3.0 mh. Miller 6318 or North Hills 700A.
L_2—Main coil—120 to 150 micro. h. Miller 4512 or North Hills 120H.

supply, is an improvement on an older instrument.

The older instrument suffered from undetected drift in the difference amplifier and discriminator and was hypersensitive to inter-signal noise and heterodynes. Circuit of the improved instrument, shown in fig. 2, is complete with check controls, front-panel balance and frequency adjustments, and automatic sensitivity control, (so that it has minimum sensitivity with no signal input). A jack is provided on the rear chassis skirt to make the frequency reference, a 455.5 kc crystal oscillator, externally available.

An incoming signal, from the last receiver i.f., is amplified by the 6BA6 (V_2), which is also connected to the receiver a.v.c. line, so that output amplitude, for all signals above a.v.c. delay level, is substantially constant. When no signal is incoming, sensitivity of the amplifier (V_2), and of the indicator circuit (V_4), is reduced by the drawdown circuit, consisting of V_5 and its 47K plate resistor. An incoming signal produces a.v.c. voltage which promptly cuts off V_5, restoring the sensitivity of the i.f. and d.c. amplifiers.

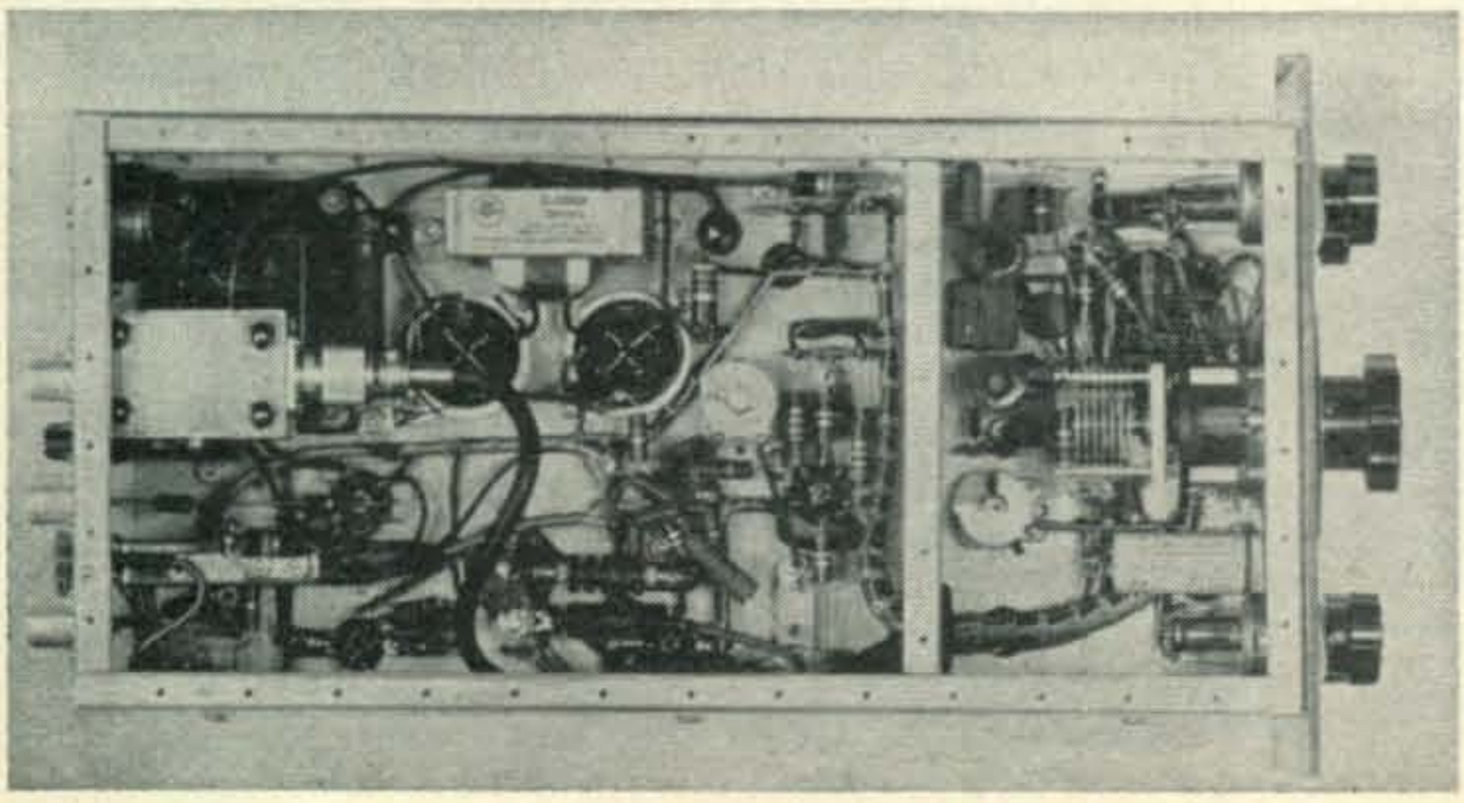
The discriminator uses the familiar Foster-Seeley circuit, which gives zero d.c. output when the signal and tuned circuit are at the same frequency. It produces a positive output when the signal frequency exceeds tuned circuit frequency and a negative output when the signal frequency is less than tuned circuit frequency. A test point, connected to the discriminator load center tap, facilitates initial adjustment of this circuit.

The difference amplifier, V_4, which converts discriminator voltage into meter readings, is entirely conventional, and is a very consistent performer. Balance of this circuit is checked by a push button, and adjusted by means of a plate circuit potentiometer.

To permit checking of the discriminator center frequency, and to facilitate readjustment when necessary, a crystal calibrator, set exactly at the center frequency of the receiver i.f. passband, is provided. The crystal is a surplus item, a few hundred cycles higher in nameplate frequency than the center of the receiver i.f. passband. It is brought to exact frequency by adjustment of the shunt capacitor (CRYSTAL ADJ.).

So that the resonance indicator will be at maximum sensitivity during checking, and to prevent spurious readings from an incoming signal at this time, the oscillator output is switched into circuit by a relay, which also disconnects receiver input (K_1). The drawdown tube, V_5, is simultaneously disabled by another relay (K_2). The relays are out of circuit when the rear chassis jack connection to the crystal oscillator is used.

It was found necessary to shield the relays, and to damp them with 0.02 mf capacitors and "reversed" diodes, to absorb coil flybacks. These



Bottom view of the tuning aid. The Q multiplier occupies the left section of the chassis and the resonance indicator shares the right section with the common power supply. The Q multiplier input is through the lower SO-239 connector which feeds into the small enclosure containing the 0.005 mf input capacitor.

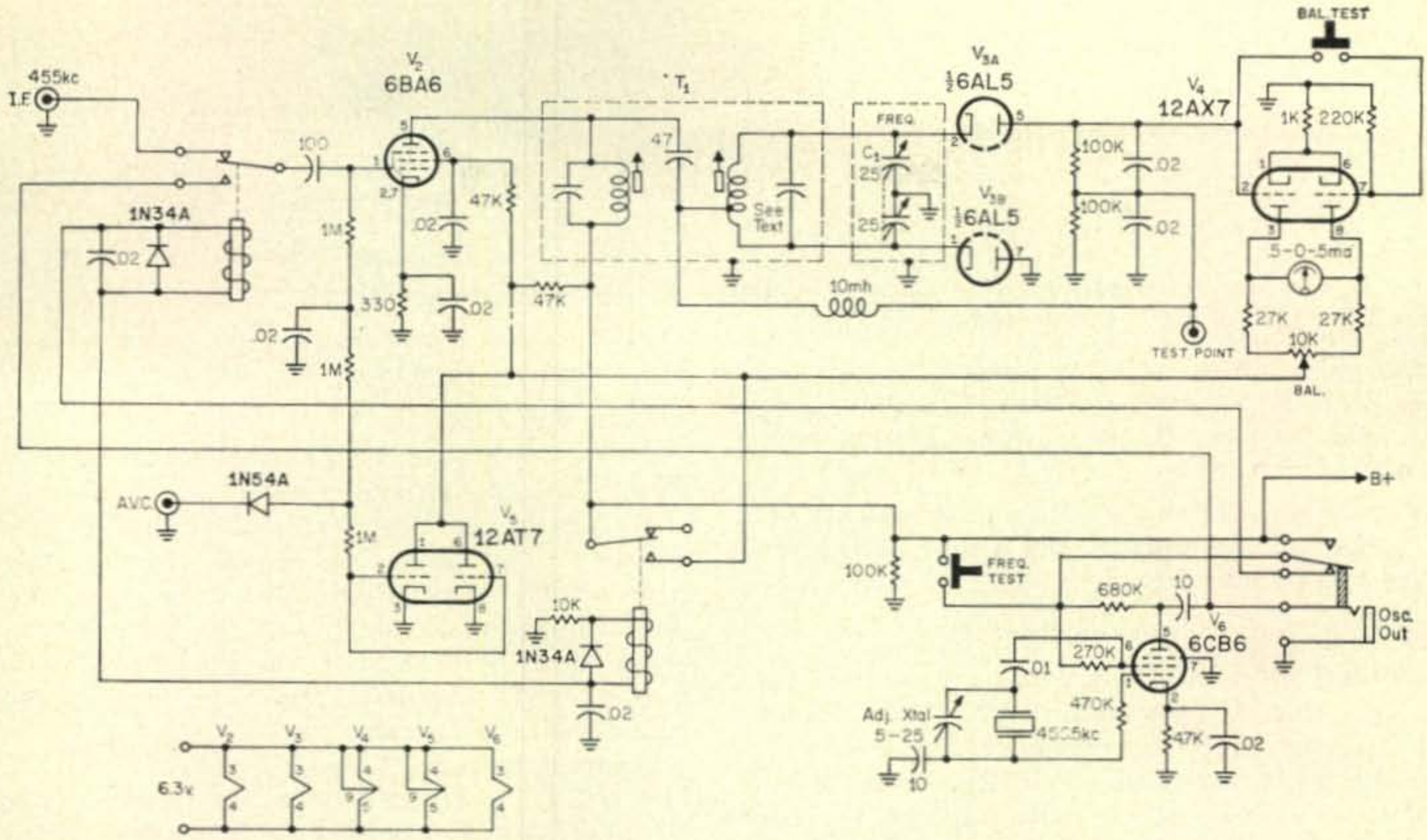


Fig. 2—Circuit of the resonance indicator portion of the tuning aid. The descriminator transformer, T_1, is a Miller 913-CD modified as explained in the text. The FREQUENCY control, C_1, is tightly shielded with a cover can as shown in the photos.

must be mounted close to the relay and within the shield can.

Relay mounts consist of bakelite disks bolted to the tops of "gutted" and inverted Cinch-Jones type S-308-RP sockets, over which a round shield can is a press fit.

The discriminator transformer is modified by reducing the secondary shunt capacitance by about 20 mmf to permit a convenient tuning range with the external FREQUENCY adjustment capacitor. This capacitor must be tightly shielded and is connected across the discriminator secondary with *firm* shielded leads.

A 1N54-A diode is connected in series with the a.v.c. input to keep "contact potential" from V_2 and V_5 out of the receiver a.v.c. system where it would defeat the built in a.v.c. delay.

The power supply circuit shown in fig. 3 uses standard components, and employs silicon diodes to reduce heat, and consequently to lessen thermal drift. The filter capacitors are socket-mounted to facilitate testing and replacement.

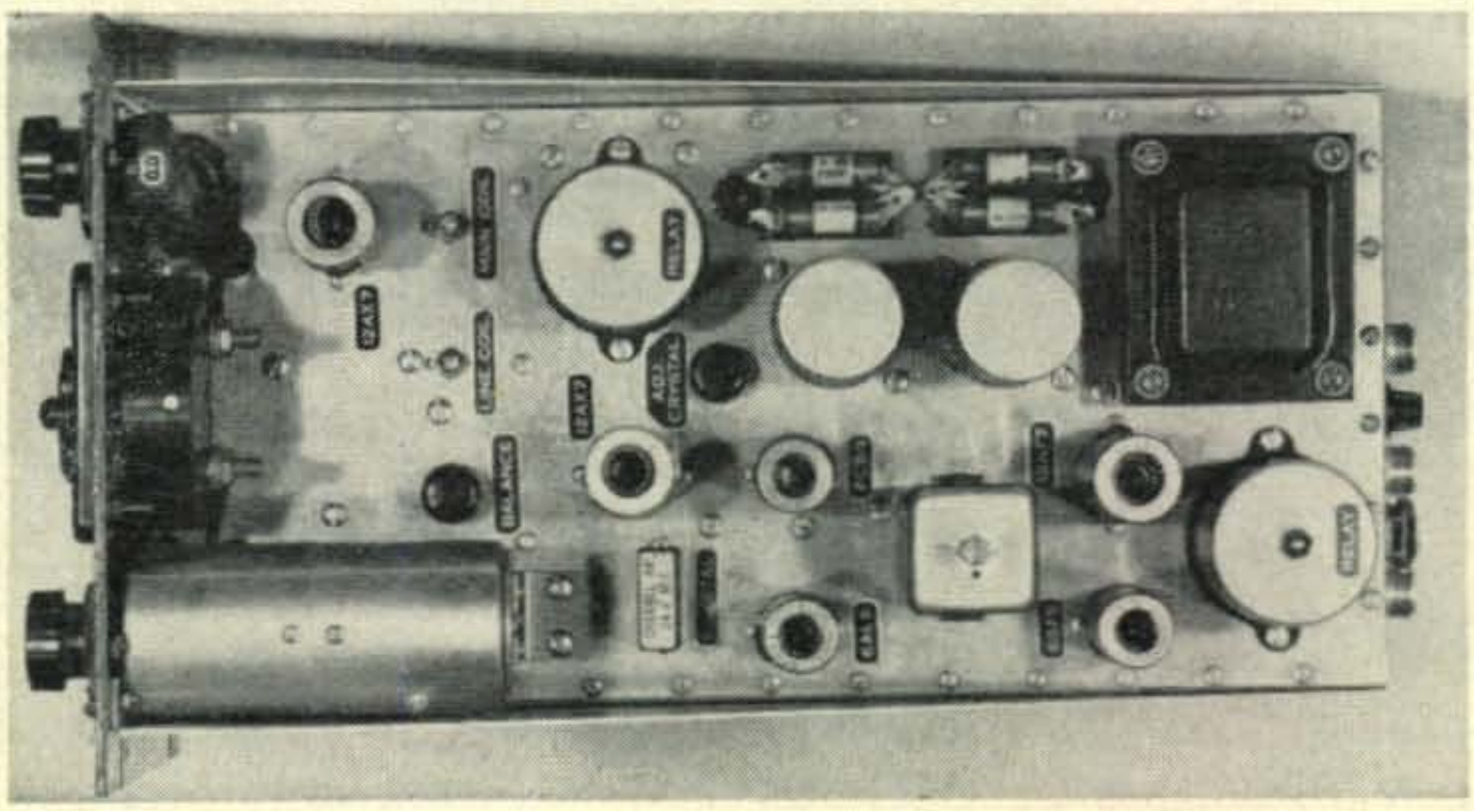
The power supply circuits is shown in fig. 3. Note that filaments are biased positive with respect to ground—a potent method of hum reduction.

To increase operating convenience, suitable function labels are most desirable. Those illustrated are Metalphoto labels, made and applied by the Kohler techniques.[3] These labels are substantially immortal.

Dial locks (Bud DL-1947) are provided to protect the BALANCE and FREQUENCY settings against accidental or meddling readjustment. These controls normally need adjustment only every few weeks.

A chassis bottom plate is desirable to prevent intercoupling of circuits. To prevent eventual stripping out of the holding screws, the lower chassis flanges are "backed up" with ⅛" by ⅜"

[3]Kohler, G. M., "Photography Makes Custom Labels," *Electronics,* Vol. 33, No. 1, Jan. 1, 1960, pg. 100.



Top view of the tuning aid showing component layout. The Q multiplier is located in the front section of the chassis and the resonance indicator and power supply are in the rear section. The FREQUENCY control for the resonance indicator is in the shield can attached to the front panel. Note the support bracket for maximum stability.

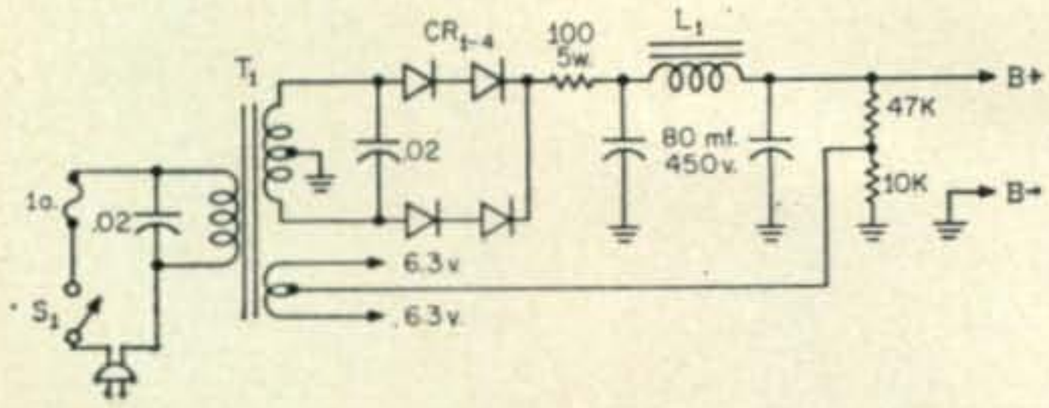


Fig. 3—Circuit of the power supply section of the tuning aid is conventional.

$CR_{1, 2, 3, 4}$—150 ma, 600 p.i.v. each.
L_1—16 h, 50 ma. Stancor C-1003 or equiv.
T_1—480 v.a.c. c.t., 70 ma, 6.3. v.a.c., 3 amp. Stancor PM-8419 or equiv.

strip brass, held in place by countersunk flathead screws, and the holes for the bottom plate screws are tapped into this.

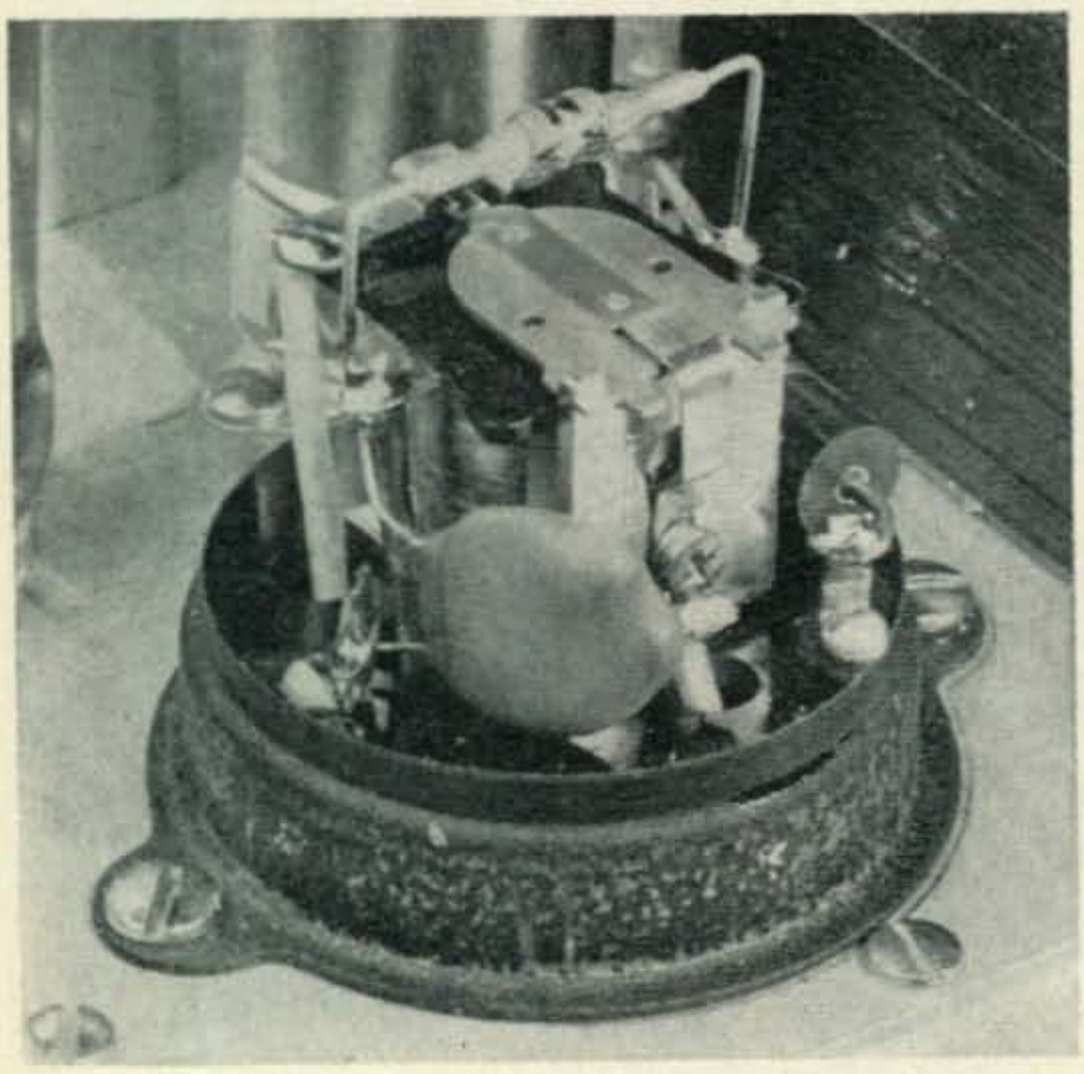
Connections

Receiver connections are as follows: the Low Level I.F. is connected to the first i.f. plate, using a series 10 mmf capacitor, firmly mounted, and a good connector (SO-239). A similar connection to the last i.f. plate provides the High Level I.F. Connection to the receiver a.v.c. line is made in any convenient fashion. After the connections are made, the respective i.f. circuits should be retuned slightly, to compensate for the added shunt capacitance.

Adjustments

Check all circuits carefully, and check the receiver alignment. To adjust the tuning aid, connect the crystal oscillator output (rear jack) to the receiver i.f. input. Be sure that receiver and tuning aid have power. Then tune the ADJ. CRYSTAL capacitor for maximum S-meter reading. Be sure that this is a true maximum, and not one end of the capacitor tuning range.

Next, pull the plug from the rear jack, remove V_5 from its socket, push the CHECK BALANCE button, and adjust the BALANCE control until the meter pointer is centered. Release the push-button, and reinsert V_5. This balances the difference amplifier.



Close-up of the relay showing the 0.02 mf capacitor and the diode used to suppress the inductive kick.

View of the rear chassis flange of the tuning indicator shows the location of the various inputs.

Now, connect a v.t.v.m. between the rear Test Point and ground. Center the FREQUENCY dial, depress the TEST FREQUENCY button, and adjust the primary slug of the discriminator transformer for maximum v.t.v.m. reading. Adjust the secondary slug until the panel meter reads center scale. Release the TEST FREQUENCY button. This completes the alignment of the resonance meter circuits.

Connect the Low Level I.F., High Level I.F. and A.V.C. terminals of the tuning aid to like terminals already installed on the receiver, using good cables and connectors. Warm the equipment up, tune in a steady signal and touch up the last receiver i.f. plate circuit to compensate for cable capacitance. Adjust the Line Coil slug in the tuning aid for maximum S-meter reading. Set the TUNING capacitor to mid-scale, throw the FUNCTION switch to NULL position, and, with the NULL DEPTH control about half way in, adjust the Main Coil slug for minimum S-meter reading.

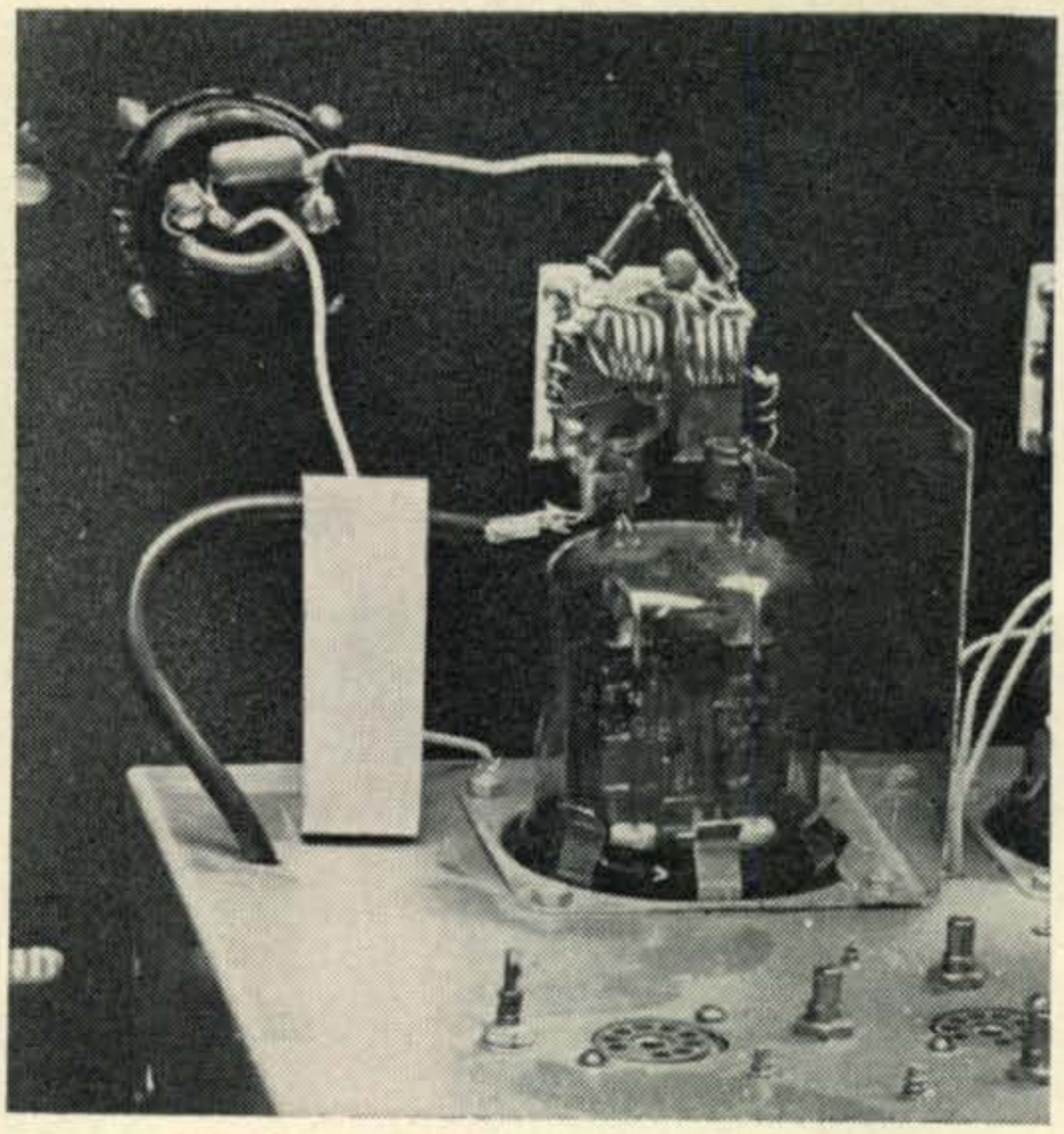
Now, throw the FUNCTION switch to PEAK, set the PEAK HEIGHT control about half way in, and adjust the BALANCE capacitor for maximum S-meter reading. This completes the alignment of the Q multiplier circuits.

During the adjustment procedure, it will probably be found that some control work backwards. As a general rule, all controls should have the same "handedness", so that a clockwise rotation of any control, including the receiver main tuning knob, will move the resonance indicator pointer clockwise also.

Sense of meters and potentiometers is reversible by reversing the leads. Capacitor sense is reversed by rotating the knob 180 degrees on the shaft.

When all adjustments are completed and checked, and control rotations are set to your liking, the tuning aid is ready for use. Resonance indication is automatic and obvious—set the tuning knob of the receiver so that the meter reads center scale. Reading of the instrument (500-0-500 microamps) is very nearly in cycles off center frequency. Checking of the resonance meter is made possible by the two TEST push-buttons on the panel, and immediate readjustment is made possible by the BALANCE and FREQUENCY controls.

Operation of the Q multiplier is entirely standard and conventional, but its full potentialities may not be realized until it has been used for some time. ■



View of the 829B final in a converter-linear used to put a 20A on two meters sideband. Two tubes have been removed to give a clear field of vision.

THE 829B ON TWO METERS

BY DAVID S. SEARS,* W8AER

AFTER building several 2 meter rigs using 829B's in the final amplifier, I was never quite satisfied with the very small grid and plate coils. I usually came up with about three turns of #14 wire ½" in diameter and spaced about ¼". Another annoying thing was the difficulty of getting the antenna link properly meshed with the tank coil. The third annoyance was the parasitics. I wanted to at least achieve the first goal of getting a bigger tank coil, and by so doing apparently solved the other two.

We had used several 2E26 tubes on 2 meters and found that you have to go to series tuning to get a reasonable size tank coil, so we whipped up a push-pull circuit for twin tubes, series tuned, such as 829B or 832A, etc.

Components

The grid tank is made up of two sections of four turns of #14 wire and spaced ⅛" wound in the same direction. The plate tank is also made up of two coils, 4 turns of #14 spaced ½". These two coils must also be wound in the same direction.

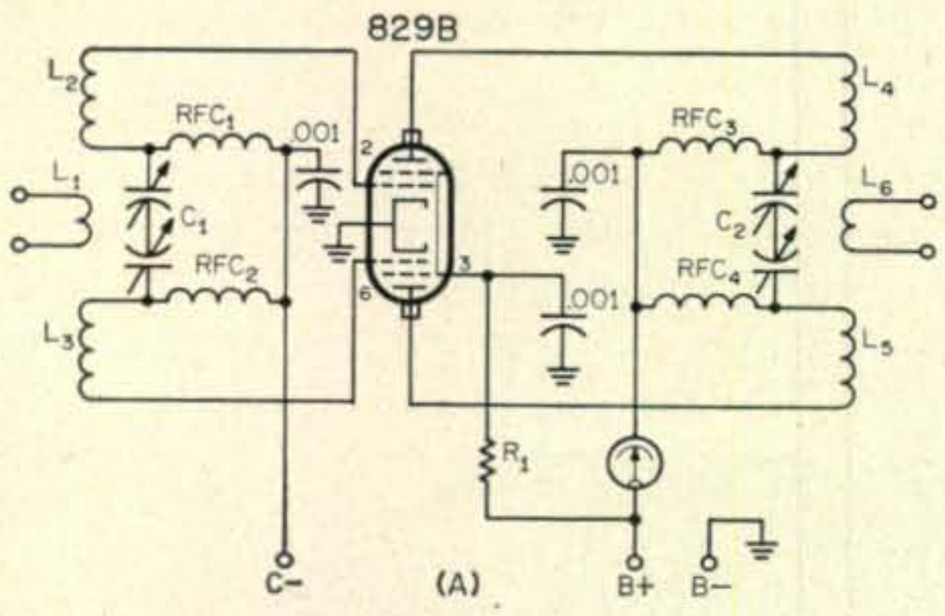
The two tuning capacitors are butterfly types such as the Hammarlund BFC12. Do not ground the rotor of either variable.

The four chokes (2 grid, 2 plate) are wound on one watt resistors of a high value, 1 megohm or over. Put on all the #30 wire you can get in a single layer.

In the conventional parallel tuned circuit the r.f. has a choice of going through the tank (if you are lucky) or from the plate lead to the tuning capacitor to ground, which would produce a parasitic of perhaps 200 to 300 megacycles. Use of the series tuning method seems to eliminate this.

[*Continued on page 100*]

*3100 Schwartz Road, Columbus 27, Ohio.



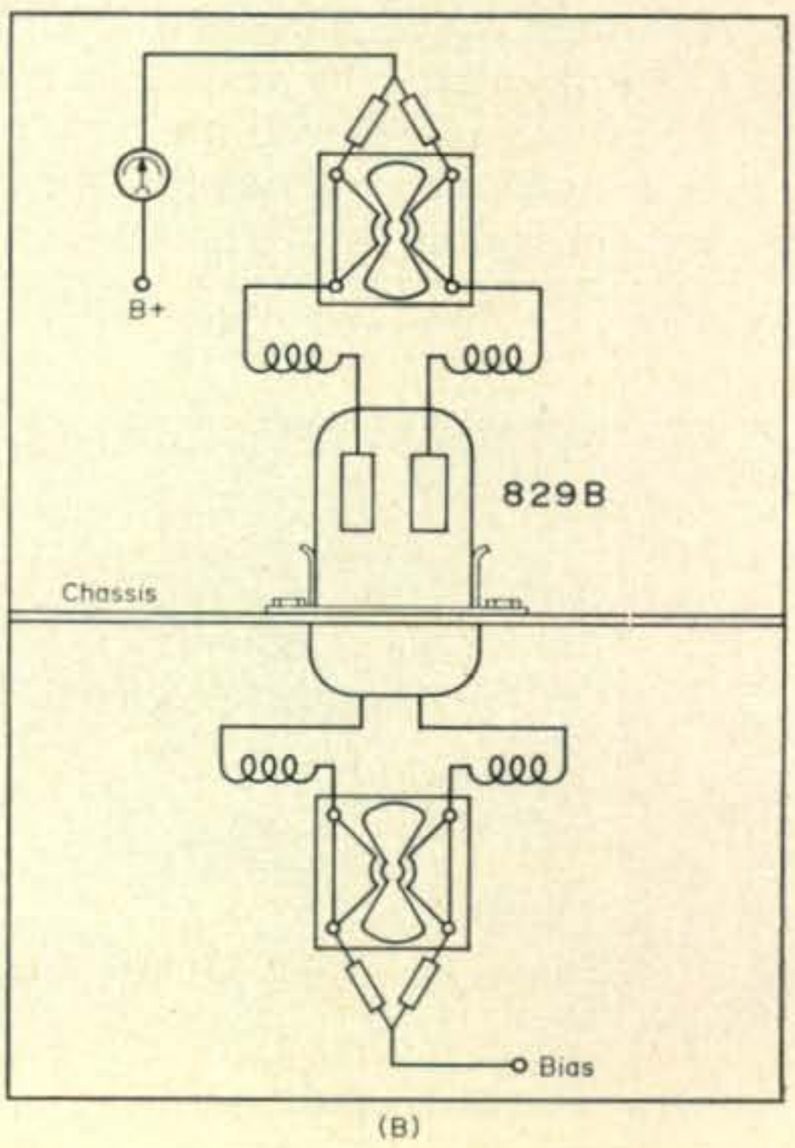


Fig. 1 (A)—Circuit of a 2 meter final using the 829B. The value of the screen resistor R_1 is from 20K to 30K depending upon the applied voltage. Capacitors C_1 and C_2 are butterfly variables and the rotors are not grounded. (B)—Mechanical arrangement of the circuit.

C_1, C_2—3.4 to 14.5 mmf butterfly variables. Hammerlund BFC12 or equiv.
L_1, L_6—2t #14 e., ½" dia.
L_2, L_3, L_4, L_5—each 4t #14 e. ½" dia., spaced ⅛".
RFC_1 through RFC_4—See text.

A Quiet Weekend-(in a pig's eye!)

BY SYLVIA MARGOLIS*

"SORRY, Rundy, I don't care if your feet are killing you. If you want to come into this booth and sit down, you'll have to join the Society and it will cost you $3.85 until the end of March, 1967!"

O.K.—so he's a nice guy and a distinguished DX-er and he had those rare OD5, EP and FL8 calls. But we had ten workers and only five chairs and 3,000 people had passed our booth the last day of the Radio Society of Great Britain's International Radio Communications Exhibition. If he wanted to take the weight off his feet, it was going to cost!

Rundy, K6ZA, did join the Amateur Radio Mobile Society and the subscription was cheap at the price, just to snatch a few moments' respite from the shuffle of thousands of feet, the parrot-house clamour or thousands of conversations, the jingle-bells of the RTTY and those two, throbbing, aching, mercy-imploring, size ninety-nine feet. We didn't give him long to rest, for the Society is run entirely by voluntary workers and, once you have joined, you are a voluntary worker. Five minutes after signing his own check, Rundy was shepherding in the next victim and helping him fill up the entry form. Which is as it should be. How else did we grow so big and sassy in only seven years?

If Rundy had asked for sanctuary on the first day of the Exhibition, when only about 2,000 visitors arrive, I might have demonstrated that I am truly a tolerant, sweet-natured and equable woman (and I'll fight anyone who says I'm not!) On the first day we have been known to offer visitors, especially nice, overseas visitors like Rundy, coffee, sherry, candy and even, the final accolade, the opportunity to buy us lunch. We have acted as cloakroom for those ubiquitous British raincoats, as parcels depot, first-aid post, assignation bureau (it's surprising what radio amateurs find time to do between QSO's) and even baby-park. One member deposited his drowsy son with us, 'just for a few minutes.' After ten minutes we draped Junior across four of our chairs, covered him with somebody's fur coat and there, for two hours, was another satisfied customer.

These great exhibitions are a firmly-established feature of the London scene, as popular and successful as the theater, the Changing of the Guard and the Royal Family. For the largest shows, London becomes full as an egg, than

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A general view of the R.S.G.B. International Radio Communications Exhibition.

The author with W4PVI (TF2WJF) and G3TR.

which you can't get fuller. In tiny Britain, with little unemployment and the Affluent Society, a spree in the capital, rarely more than a day's trip from home, to take in an exhibition, some theaters and an orgy of shopping, is well within the means of most people.

That it becomes more difficult than normal at exhibition times to find hotel rooms or to drive through the streets is an accepted part of the ritual and adds to the fun. One Dutch radio amateur, PAØDAX, did venture to the Communications Exhibition without a hotel booking. We scolded him, advised him to shoot his travel agent when he got home, for sending such an innocent Daniel into a cage of such ferocious lions, then set to on the phone. It took an hour, and eighteen calls, a detailed knowledge of London and an inspired guess to book him into one of the new hotels a few miles from the center. These are useful, for their rates are not so extortionate as in the posh districts and the facilities are all you could want.

The Communications Exhibition is cunningly timed to coincide with two of the largest national shows. Out-of-towners and overseas visitors, who pour into London, are quite often operating on lovely, lovely expense accounts or are simply treating themselves to a binge on the town. Despite our screwball liquor licensing laws, they manage to be gently 'relaxed' most of the time and wander into the Seymour Hall, thinking they had found the Motor Show . . .

(Photo courtesy of Jack Barclay Ltd., London)

(Photo courtesy of *Farmers' Weekly*, London)

or the Dairy Show,

and it does take time to convince the darlings that it is amateur radio they are seeing, as they try, with amiable persistence, to milk a linear amplifier or ascertain the brake horse-power of a v.h.f. converter. "Yes sir, AMATEUR radio—well, ham radio if you want to call it that—no, not pig farming—ham RADIO yes, that's right

GI3KYP; Rundy, K6ZA; W6ULG—all at the Reception for overseas visitors.

—all dots and dashes and ships in distress and amateur satellites and world brotherhood and—what's that? Television interference? Oh no, sir, I think not—never heard of such a thing—look, why don't you go over to the Motor Show—that porter over there in the uniform will find you a taxi—no, not him, you blasted idiot—that's the Admiral come to inspect the Royal Navy booth!"

In a country where you can get away with practically anything, provided you do it without ostentation, where exaggeration is considered a carnal sin and understatement a virtue, it is startling it hear it stated, *unequivocally*, that the Radio Communications Exhibition is by far the largest amateur radio event in the world. But it is a fact that close on ten thousand people pass the turnstiles each year.

The Seymour Hall, near Marble Arch, is in reality a very large swimming pool, but they cover the hole with a floor and produce a very decent hall, popular for the smaller of the exhibitions which entertain and tantalize Londoners the year round.

We voluntary workers, long-suffering but ever-loving wives of radio amateurs, indulge the occasional quiet moment in deliciously erotic fantasies, wherein that very floor collapses and the whole darned shebang splashes gloriously into the chlorinated depths below. No doubt the pool is drained before an exhibition, so any little miscalculation would result in death by multiple fractures, rather than drowning, but it's a pretty thought. Which would they save first—themselves, the Collins, the Hammarlund or the Hallicrafters? Or would "national pride" prevail? Rule Britannia and dive for the British-made equipment!

The Amateur Radio Mobile Society is the largest organization in the world which caters for mobile operation. It is probably best known for the pioneer work which it did in the struggle for reciprocal licensing in Europe and for its magazine, *Mobile News*. The Society's booth at the Exhibition is manned, or womanned, by a few demented volunteers, who do an eleven-hour day on their feet, with ten-minute breaks for meals. As the lunatic said, when asked why he was banging his head against a wall:

"It's so nice when I stop!"

What we lack in technical know-how we make

Three of the men responsible for the granting of reciprocity in Europe: Mr. George Wallace, M.P.; René Vanmuysen, ON4VY; Eric Yeomanson, G3IIR, then President of R.S.G.B.

up in fast-talk. A critic said we run the project on a platform of reciprocal licensing and Chanel Number Five. Maybe, but we notice now that Auntie R.S.G.B., who recently brought to a triumphant conclusion the reciprocity negotiations in Britain, also use women to staff their great big booth. So, although Englishmen don't believe in it, there must be something in it.

To do this work you need the constitution of a dim-witted ox. Constant offerings of tea, coffee and that unique and inimitable distillation, which compensates the Scotsman for his extraordinary homeland, help to keep us going. When visitors comment on my amazing stamina, I reply that I feel tired only when I am bored and one of the things that bore me is people who comment on my amazing stamina.

Every aspect of amateur radio is represented. All the manufacturers are there and so are the specialist organizations—amateur TV, RTTY, mobile and the radio clubs run by the Armed Forces; the amateur Press, may its shadow increase, and the GPO, whose very snazzy booth sports a model of the new Post Office Tower. Our highest building, it goes up 620 feet, has a revolving restaurant on top and is something ever so clever to do with microwaves.

The Briton has an inherent distrust for foreigners. But even he is at last getting around to the idea that foreigners do exist, that they are human, more or less, that they represent precious export potential and that some of them, surprisingly, are dashed good chaps! A shared language, Bob Hope and John Lindsay render United States citizens quite tolerable, despite that little bit of nonsense back in 1776.

Greatly daring, the Radio Society of Great Britain last year instituted a Reception for the hundreds of overseas visitors who come to the Show. This year Maurice and I were invited, too, probably because of those *darling* OE9, ON8 and PA9 calls which blessed, blessed reciprocal licensing has already bestowed on my old man, and which have subsequently ruined any chance I ever stood of getting a rest from amateur radio during our vacations. Or maybe we slipped in under the label of "Press," which is the modern *abracadabra open sesame* and has got me into some peculiar places at peculiar times.

Anyway, there we were and very nice, too. To our considerable discomfiture we found ourselves *proud* that we were members of R.S.G.B.

It is normal and decent to look on one's own national amateur radio organization as fair prey for criticism. The exercise of such, which had occupied us happily for years, is considered good, clean fun. But this time I had to confess to R.S.G.B.'s General Manager, G2AHL, John Rouse, and the Executive Vice-President, G2BVN, Roy Stevens, that, if R.S.G.B. carried on in this way, soon we would have nothing to grumble about. They agreed that this indeed meant trouble for somebody.

A distinguished Guest of Honor at the Reception was Mr. George Wallace, the Member of Parliament who was instrumental in getting the reciprocity negotiations off the ground in Britain. Another was ON4VY, René Vanmuysen, past-President of the Belgian national society, U.B.A. It was René, in early 1963, who completed those very first negotiations with his government which resulted in the issue of temporary Belgian licenses for foreigners at the Verviers Rally. Thus he is the man who broke the reciprocity deadlock and paved the way for Goldwater in the U.S.A. and Wallace in the U.K.

At this Exhibition overseas licensed operators were of course permitted to work with the Exhibition stations, GB3RS and GB2VHF, but this time special permission had also been given for overseas amateurs visiting the Exhibition to operate the home stations of their hosts.

Looking round the crowded, noisy room, I could see amateurs from Belgium, Holland, U.S.A., Iceland, Germany, Chile, New Zealand, Canada and Ireland. The then President of R.S.G.B., G3IIR, Eric Yeomanson, welcomed the visitors and we all drank coffee and ate goo-ey cake and peered at each other's labels. A most discerning Belgian amateur told me I had beautiful eyes and I said his *yeux* were extremely *beaux*, too. At least, I think that's what he said.

Most visitors to the Exhibition make several trips there. The first is genuinely to see the exhibits, study new techniques and perhaps buy something. The other visits are for only one purpose—to meet their friends. This might be the one opportunity in the year to put a face to a callsign, to personalize what has hitherto been only a disembodied voice. On the last day, a Saturday, the aisles are jammed with a viscous flow of visitors, moving sluggishly around stationary islands of rag-chewers.

How they can talk, these radio amateurs! Back-thumping, belly-punching, hand-pumping, QSL-swapping, DX-boasting, beer-drinking—all those things they may be, but surely they are more *articulate* than any other hobbists. They group around the demonstration stations, criticize the operating techniques, gloat over the glossy commercial equipment on the manufacturers' booths and TWIDDLE KNOBS. They

[*Continued on page 102*]

REWINDING OLD TRANSFORMERS

BY LYALL SHERRED,* K9VHA

The power transformer is frequently a cost problem when building a final. The author describes the reconstruction of a burnt out discard from a local radio station. The techniques described are applicable to all types of power transformers.

RECENTLY, I acquired a burned out transformer from the local radio station. The enterprising ham can often find burned out transformers ranging in size from junked TV types to those good for kilowatt plate supplies. The one which I found was made by Kenyon, filled with tar, and originally had a 220 volt primary with a 3000 volt, center tapped secondary.

Many old transformers are filled with tar and there is no simple or clean way to remove the tar. However, there is a way *not to* remove the tar. Heating the tar only makes a sticky smelly mess. The best way, I have found, is to get the transformer as *cold* as possible and break the tar out. With a little care the tar can be removed without damaging the insulation on the transformer.

On any burned out transformer, always inspect the leads because there is a good chance that the wire burned loose where you can get at it saving the task of rewinding. In the case of my transformer this was not so.

Winding Check

When a transformer burns up several things may occur. Both windings may be cooked to a crisp. In this case you will need to rewind both the primary and secondary. Either the primary or the secondary may be burned. If only the secondary is burned you can still use the primary. Often neither winding will appear burned, but when the primary is connected to the a.c. line with a small fuse, the fuse will blow. One amp fuses for small transformers, and four amp fuses for large transformers are invaluable aids as well as mandatory safety devices. Often when the output of a transformer is shorted and as it begins to burn, individual turns will short. While the voltage between the turns of a transformer seldom exceeds two volts, even on a large transformer, the shorting of a single turn will ruin the transformer.

If the examination of the transformer does not disclose the fault it must be disassembled. Drive apart the leaves of the core and remove them. Then, with a long nose pliers, pull the inner windings of the secondary out until the primary winding can slide free. The larger the transformer and the larger the wire, the easier the task of digging out the wire. It is also possible to unwind the entire secondary to free the primary but the first approach seemed easier and the secondary might still be good.

Reassemble the core in the primary. It is not necessary to replace all of the core but a sizeable portion must be put back. This includes both the E and I leaves. Never apply voltage to a primary without a core.

After the core is reassembled connect a fuse in the primary and check. My transformer did not blow the fuse showing the short to be in the secondary. Had the fuse blown, I would have had to rewind the primary. Always rewind the primary with the same size and number of turns of wire as it originally contained.

Turns Ratio

The voltage of the secondary of a power transformer is the product of the turns ratio. If a 120 volt primary has 240 turns, each turn of the secondary will produce ½ volt. Twelve turns

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of wire will produce six volts, *etc*. The larger the transformer, the greater the voltage per turn and the fewer turns required for a given voltage.

I decided to wind a 1200 volt center tapped winding for the transformer. This seemed to be most flexible. It could be used with high current silicon rectifiers to provide 600 volts in the full wave rectifier. It would give 1200 volts in a bridge circuit, or 3000 volts in a doubling circuit. At 600 volts it could be used for a multi tube transmitter using a dozen TV horizontal oscillator tubes. At 1200 volts, it could power several 7094 or 811 tubes, and in a doubler circuit, it would easily power a 3-1000Z.

A count on the primary showed eight turns between the 225 volt tap and the 235 volt tap which meant that eight turns would give ten volts. The primary wire was #12, capable of easily carrying 6½ amps. From a wire table you can find the circular mil area of copper wire. A conservative design figure is usually considered 1000 circular mils per amp for large transformers and 700 circular mils per amp for TV transformers.

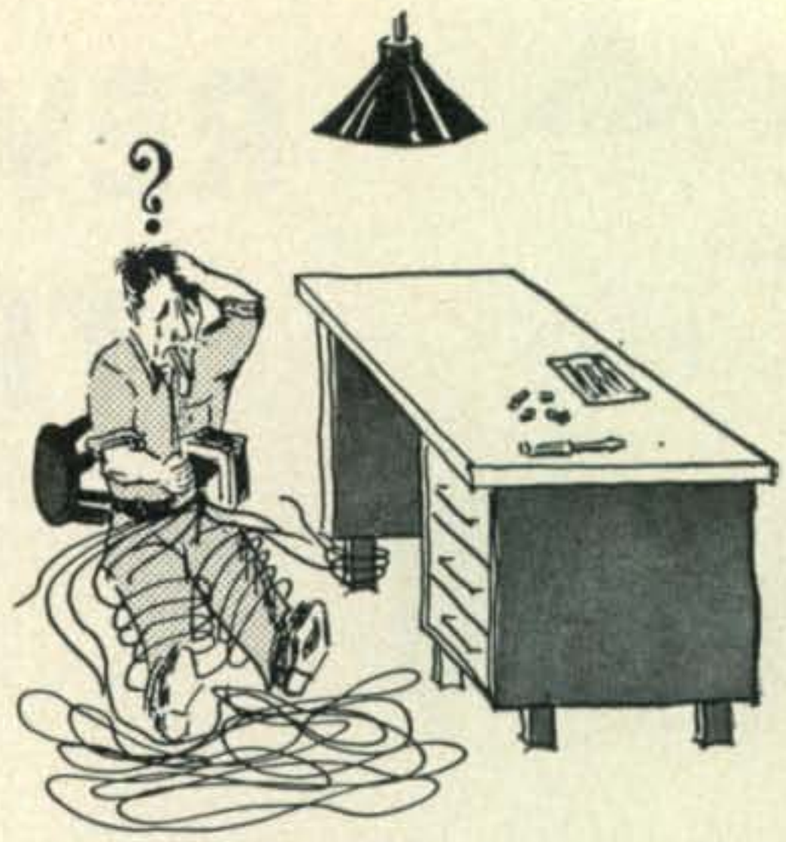
After wrapping the primary with a layer of "fish paper" the winding area was found to be 3½" by 1". This was the window area remaining after the primary. Be careful that you can replace the laminations after winding, because you never get all of the turns on per inch which are possible, and the insulation can take up just a little more space than you plan for it. It is sad, indeed to finish the windings and not have enough room for them on the core.

If the primary was capable of 1430 watts, is there room for a secondary of wire size to match? At 1200 volts the wire would have to be capable of carrying nearly 1.2 amps. Number 20 wire will carry slightly over one ampere at 1000 circular mil per ampere and was used for the secondary. The maximum length of any layer would have to be about three inches with ¼ inch at each end left empty to insulate the winding from the core. At 29.4 turns per inch, it was quite easy to put on 80 turns per layer. Since the ratio was eight turns equal ten volts, there would be 100 volts per layer.

Rewinding

I recommend that Nyclad or Formvar wire be used since it has a tough insulation and does not short easily. Tape the first turn to the insulating paper, and be certain that there is at least 0.01 inch thickness of paper over the primary. Put the other end of the wire in a vise or clamp in the corner of your room with enough wire unreeled to reach across the room and still remain taut. While holding a slight tension on the wire, wind the wire over the insulation. When you have wound up the wire to the vise, put a small piece of tape over the winding to keep it from uncoiling and unroll enough wire to repeat the process until the layer is finished.

On my transformer, there was 100 volts per layer which meant 200 volts between the layers. I prefer a good grade of typing paper for insulation between windings. Some fellows prefer



wax paper, but it is slick and tears easily. Typing paper can be folded, and the strips glued together to make a good layer. Since there was plenty of room for insulation, I used three layers of typing paper.

With 100 volts per layer, the center tap would come after six complete layers of wire. At the end of the sixth layer, a small loop was twisted in the wire for a center tap. I then proceeded to wind six more layers of 80 turns each and then wrapped the outer winding with a layer of plastic tape, a layer of "fish paper" and another layer of tape. Extra pieces of heavy paper were used as insulation around the area where the laminations fit. The laminations were replaced, and the original clamps were tightened. Do not worry if the last few laminations do not go back in. Instead of replacing the tar, I drilled and tapped the clamps and bolted the metal case to the transformer.

Conclusions

The larger the transformer, the easier it is to rewind. The turns to volt ratio is such that fewer turns are needed; the wire is larger and more sturdy.

With the use of silicon doubler supplies, a relatively low voltage can produce high voltages for the larger tubes. The lower voltage allows you to use heavy wire and less insulation between layers. (Use plenty of insulation between the various windings, and between the secondary and ground, though.)

For practice, the winding of a filament transformer, or a 24 volt supply is recommended. It is relatively easy to rewind TV transformers with a 50 volt center tapped secondary to supply 24 volts d.c. for running surplus equipment. Use a secondary wire that will carry twice the current of the 110 volt primary. For example, if the primary is #18, the secondary should be #14.

With a little luck you may find an old transformer that will make a kilowatt for $5. It only takes a few pounds of wire, a little paper, an old transformer, and a lot of patience. You can look over your junk shelf when you need a special center tapped filament transformer, or one to overcome the voltage drop in the filament chokes of your linear, or even for the plate supply, and that is easier than looking at the prices in the catalogue. ■

PUTTING THE CHEYENNE ON SIX METERS

BY GARY E. HAMPSCH,* WA5MNQ

The Heath Cheyenne covering 80 to 10 meters can be put on 6 meters with the few simple changes outlined below.

HAVING recovered from the mobile bug bite and realizing that low power a.m. was a thing of the past for mobile operation, I found myself with a spare Heath Cheyenne transmitter. In my opinion it is one of the best Heath has made but is now worth very little on the used market. It covers from 10 to 80 at 90 watts out.

I had been on two meters in Alaska (KL7-EMG) for three years and upon returning several months ago and hearing the six meter openings, I now wanted to extend my operations to that band. The problem: How to convert the Cheyenne to a v.f.o. equipped six meter transmitter. After carefully checking the schematic, I came up with a simple conversion taking about one hour, including calibration, requiring no additional parts and consisting of four simple steps.

Conversion

The 62 mmf silver mica is removed from the v.f.o. coil (the center coil) used for 40 and 10 meters (7.0-7.45 mc) (See fig. 1A). This 62 mmf silver mica is then placed across the 20 meter coil, the one closest to the meter, in the buffer (6CL6) stage, V_2.

Next, place a short jumper wire from the ten meter tap on the final tank coil to the second turn from the left. The tap should be made on the bottom of the coil.

Last of all, remove the parasitic choke from the plate lead of the 6146. This completes the conversion.

Operation

How does it work? Six meter operation takes place with the bandswitch in the ten meter position. The v.f.o. now tunes 8.333 mc to 9 mc plus. The v.f.o. should be calibrated in accordance with the manual. The ten meter dial reading 28 mc is now 50 mc and 28.5 mc is now 52 mc. The bandspread is not as great as desired; however, the excellent gear ratio and anti-backlash provides for ease in zeroing any signal. The buffer stage is also tuned to 8.333 to 9 mc. The bandwidth is about 2 mc. With the buffer tuned to 8.5 mc, there is plenty of drive for 50 to 52 mc operation. The buffer stage may be tuned by placing the function switch in the DRIVE position, and with the meter reading drive, tune the drive control for a sharp peak. The buffer coil is then adjusted for maximum drive, about 4 ma at 51 mc. The driver (5763) now acts as a tripler. No modification is needed since the circuit tunes 25-27 mc with ease. The final (6146) is now a double-amplifier capable of approximately 50 watts c.w. or carrier controlled a.m.

With the conversion completed, the Cheyenne will now cover 80, 20, 15 and 6 meters. Do not attempt to operate in the 40 meter position as the Cheyenne will load up quite well; however, it will be outside the amateur band. Caution should be used when tuning the final since it will still tune to 27 mc.

There are also several MARS frequencies in the 8-9 mc region that can now be covered by the Cheyenne with the bandswitch in the 40 meter position.

Now that I have an excellent mobile or fixed six meter transmitter, be on the lookout for six meter signals from West Texas. ■

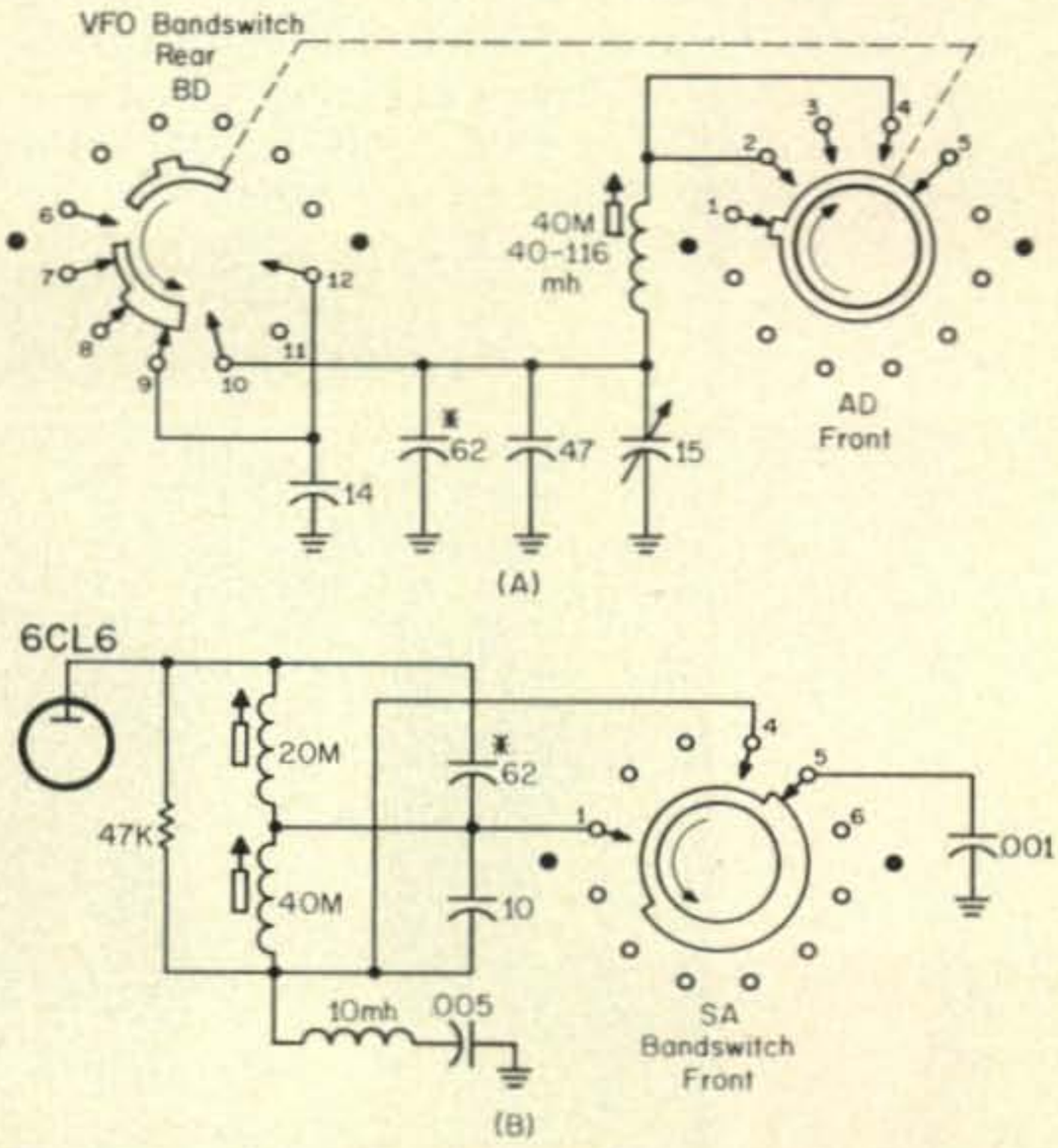


Fig. 1(A)—Removal of the 62 mmf capacitor shown above is the only modification in the oscillator circuit. (B) The 62 mmf is added across the 20 meter coil in the plate of the 6CL6, V_2.

*509 Wanda, San Angelo, Texas.

TOTATYPE II

A mobile 2 meter RTTY installation

BY LELAND R. REEDER,* WB6EYZ

THE next time you head for the hills on a Field Day operation, or just want to get away from it all, why not tote a teletype along for added pleasure? With the greatly increased use of this mode among the amateur radio operators, it is rapidly becoming mandatory that the necessary mechanical devices and electronic components for radio teletype communications be included in your plans. Such a portable station was shown at the Greater Bay Area Hamfest held in San Francisco, California. During the two days of the convention over eight hundred visitors stopped to inspect the display.

The particular unit to be described in this article was assembled for local operations on the two meter band and, of course, employs audio frequency shift keying. To build a similar station for the lower frequencies it would be necessary to change to frequency shift keying components along with a change in the transmitter and the antenna. Chief engineer for the project was WA6MSN who repairs teletype equipment during working hours and enjoys amateur radio teletype in his off-duty time. The chief operator is the author, WB6EYZ, who feels more at home with a keyboard and printer in front of him than in yakking or pounding a key.

One of the essential phases in the planning of a portable RTTY station is the hauling and housing of the relatively heavy equipment. A small truck with a camper or panel body is suitable for hauling providing that there are other uses for the truck and that there is a space to park it. We did not have either so a trailer-van was selected for the job. (These are readily available in most localities.)

The van was five feet wide by eight feet long and a six foot person could stand upright with a good six inches of headroom to spare. The unit used as a display at the Hamfest was equipped with a double swing door arrangement at the rear. Previous experience on Field Day operations, where the possibility of generally inclement weather was a problem, shows the type with a tail-gate at the rear to be more practical. In this type the bottom half is a slide out panel and the top half has a hinged panel which can be raised to form a canopy.

Portable Station Equipment

The block diagram of fig. 1 shows the basic operation. All of the equipment and furniture was designed for portable operation. Inter-connecting cables between the units had individual matching plugs and sockets so that there would be no slip-up when making connections in the field.

The rack cabinet includes the various electronic components of the teletype phase of the station. The top unit is a CV-60 audio converter which changes the tones from the receiver to usable pulses required to operate the printer. The unit just below the converter is the oscillator which reverses the above process by taking the pulses from the keyboard or the terminal-distributor and changes them into tones which are fed to the modulator in the transmitter. The circuit we found most satisfactory is the transistorized a.f.s.k. oscillator developed by

*109 Skyview Way, San Francisco, California.

Interior view of the van shows the partial set up. The rack near the doors contains a CV-60 Audio Converter. Beneath it is the oscillator for the a.f.s.k. operation. The units below are discussed in the text and, just visible is the Model 19 combination also described.

W2JAV.[1] This was built into a pull-out drawer type chassis similar to that of the CV-60 unit on top. The panel below the oscillator was used to mount switches, meters and cable connectors. One meter shows the a.c. line voltage. (This is a good item to have on portable operations where line voltages can vary all over the lot.) The second meter shows the loop current which in this installation is 60 ma. Also included is a polar relay tester which was installed behind a drop front panel. Because a polar loop is used in this hook up, the polar relay tester was considered an essential piece of test gear. The circuit for the tester was also taken from the *RTTY Handbook*. The direct current source for the loop and bias requirements are located in the base of the rack cabinet. These supplies are the common 110 volt rectifiers as manufactured by the Western Electric Company and readily available on the surplus market.

A Model 19 combination which includes the Model 15 printer, the Model 19 keyboard and sideboard tape puncher, and the Model 14 terminal-distributor is used. These are assembled on a regular Model 19 metal table. A Multi-Phase analyzer is used for checking emissions and for tuning purposes.

A three position lever switch, such as used in telephone PBX equipment, is the principal control for the station. In the center position the receiver is operating with the speaker on but the teletype printer is locked out. In the up position of the lever switch the printer is cut in and the speaker cut out. In the down position, the antenna relay is actuated, the transmitter is keyed and the receiver muted. In the latter position either the microphone or the keyboard are cut in or out of the modulating circuit by a toggle switch.

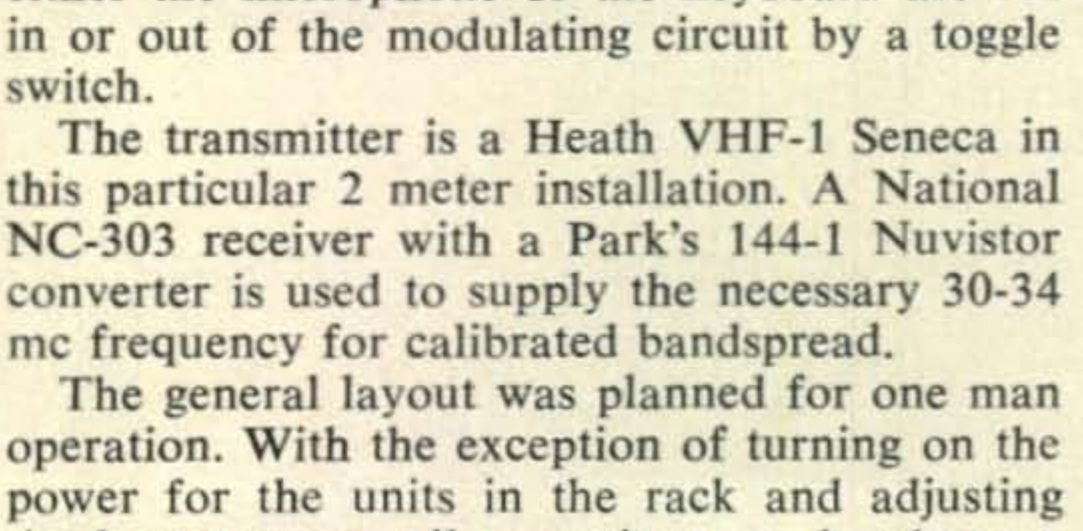
The transmitter is a Heath VHF-1 Seneca in this particular 2 meter installation. A National NC-303 receiver with a Park's 144-1 Nuvistor converter is used to supply the necessary 30-34 mc frequency for calibrated bandspread.

The general layout was planned for one man operation. With the exception of turning on the power for the units in the rack and adjusting the loop current, all operations are handy to a person seated in a swivel chair in front of the printer.

Portable Antenna Installation

Another phase of the portable operation,

[1]*RTTY Handbook*, Cowan Publishing Corp.



—Block diagram of the RTTY installation in the for emergency and Field Day operation.

Photo shows the tripod for the antenna. The base is mounted on suction cups to prevent damage to the roof. The plastic guy lines pass through metal eyes and are secured to the car body. The feed line is brought from the van.

which required some planning ahead of time, was the antenna. Two meter antennas are comparatively small and normally do not pose much of a problem. A location which is higher in elevation than the surrounding terrain is desirable and, because the antennas are sensitive to their surroundings, a certain amount of mobility can be of value. Moving a matter of a few yards sometimes results in a vastly improved signal on the two meter band.

The roof top mount and vertical antenna shown in the accompanying picture was the answer. A triangular shaped platform provided with outriggers for the guy lines was built on rubber suction cup type roof mounts. The length of the outrigger arms was kept close over the sides of the car so that the platform could be transported on the top without having to remove the arms for highway travel. A rigid TV roof jack was installed in the center of the platform to provide a base for the antenna mast.

A Webster A-59 Coax Antenna, chosen to provide omi-directional coverage and vertical polarization which is prevalent in the area, was assembled on a one inch diameter aluminum mast approximately fifteen feet high. Two skirts were added for some gain and to lower the angle of radiation. The plastic guy lines were attached to a plastic plate fabricated from 3/8" thick clear plastic sheet material. The anchor plate was slipped on the mast and held at the proper height by one of the skirts. (If plastic clothes line is used be sure that it does not have a wire reinforcing inside the plastic envelope. This could affect the signal) regular RG-8/U coaxial cable was used to feed the antenna. All antenna parts were pre-assembled on the mast and the complete antenna carried on the side of the station wagon. The erection of the antenna was quick and, in a pinch, could have been a

[*Continued on page 98*]

Harry Yoneda, JA1ANG, and his attractive XYL, discussing the latest Far Eastern DX news during a recent luncheon in Tokyo with a group of visiting radio amateurs.

Natan Sterental, OA4OS shown operating his station in Lima, Peru. Natan is one of Peru's outstanding radio amateurs, and he can usually be found on 15 and 20.

PEOPLE AND PLACES

For the past six years F3AR, F9UL and I1ER have been conducting "knife-edge diffraction" experiments on two meters over a 200-mile path between Belfort, France and Milan, Italy. The 12,000-foot Jungfrau mountain is at the mid-point of the path. Shown above is Andre (F9UL) during a recent visit to Mario's (I1ER) QTH in Milan. Behind them can be seen the mast for the two-meter Yagi array used on the Milan-Belfort circuit.

Bill Orr, W6SAI, author of *The Beam Antenna Handbook*, stands proudly in front of his own beam antenna at his Menlo Park, California QTH.

Holiday greetings to servicemen via amateur radio were handled in the Schenectady, New York area through a cooperative effort by the Schenectady County Red Cross and local AREC members. Shown discussing this program at the Schenectady Red Cross are: l. to r., S. I. Bateman, Executive Director, Schenectady Red Cross; George W. Tracy, W2EFU; Charles H. Muir, WA2CGD.

Harry J. Dannals, W2TUK, ARRL Hudson Division Director, presents the Lawrence Kohlman (K2BVC) Memorial Award to Arthur H. Brooke, CD Director of New Rochelle, N.Y. at the Communications Club of New Rochelle Dinner. Henry Wymbs, WB2GMN, President of CCNR in announcing the award, paid tribute to the late K2BVC as an outstanding amateur and to Mr. Brooke for his many contributions to the amateur servic both in the City of New Rochelle and elsewh (Photo by Westchester-Rockland County Ne Group)

DX

BY URB LE JEUNE,* W2DEC

This impressive looking station is OE5NT. Ernst built most of the equipment himself. (Tnx VE3-9301)

Here and There

CR4 Cape Verde: Bob, W2VCZ, reports that he has turned back the QSL chores of CR4AJ to Jorge. Now that the pile has been taken care of, Jorge can cope with it himself.

CR8 Portuguese Timor: CR8AF on 14090 kc at 1200 GMT. *(Tnx LIDXA).*

EA8 Canary Island: John, EA8CR, on 14245 kc around 2100 GMT. *(Tnx LIDXA).*

EP Iran: George, EP2DS, has left Iran and is now operating as W9AUM. Bill Baxter, FP2BX, had a serious auto accident and is now in the states recuperating. His QTH is: 8625 So. La Cienega Blvd., Inglewood, Calif.

FL8 French Somaliland: There are now three stations active in FL8 . . . other than Claude, FL8MC, and Andre, FL8RA. There is Roland, FL8AO. He is very active but on phone only, on 20 and 15 meters with a Johnson Viking TX donated by Trigger Electronics. FL8RA is always active on 15 and 20 c.w. and now has a Heath Cheyenne and expects to be active on phone from time to time. FL8MC is active on 15 and 20 c.w. also and hopes to get on s.s.b. eventually if rig arrangements can be managed by his QSL Manager, W7WLL. FL8MC hoping to get a beam eventually, too. Thanks to Al, K1QHP/ET3USA, for the above info.

FU8 New Hebrides: FU8AG on 14090 between 0800 and 1030 GMT. *(Tnx LIDXA).*

FB8 Bouvet Island: Henry Charre is the new FB8WW on Crozet Island, thanks to the persuasiveness of Claude, F9LC, and Jacques, F3DJ. With previous operator Maurice leaving the island, it had been expected that ham activity would come to a halt. Not only did Claude and Jacques convince Henry to take the assignment but they also arranged for Hallicrafters to rush a sideband station down to Reunion Island in time for the equipment to go aboard the relief ship with Henry on December 27th. Consisting of an SR-150 and SX-117 plus power supply and spare parts, the equipment went out during busy Christmas week and it was only through the extraordinary cooperation on the part of Pan Am and Air France officials that it arrived on Reunion four days after it was sent out from the states.

The Hy-Bain people also got into the Christmas spirit and sent out a new beam antenna to Henry.

FB8WW QSLs for Henry's activity only will be handled by Dorothy Strauber, K2MGE, 12 Elm Street, Lynbrook, N. Y. 11563, who requests GMT and s.a.s.e. or s.a.e. and IRCs.

HM Korea: Sang, HM2BD, is on daily starting at 2300 GMT near 14230 to 14250. He uses a completely homebrew s.s.b. exciter made from locally obtained parts. He is now working on a 1400 watt final. *(Tnx WA6MWG).*

IS1 Sardinia: IS1JF on 14260 kc about 1200 GMT. *(Tnx WGDXC).*

KJ6 Johnston Island: KJ6DA is active on both c.w. and s.s.b. There are several operators, three of them are Stan, Dick, and Del. Stan works both s.s.b. and c.w. Dick is on c.w. and Del on s.s.b. They start operation daily at 1800 GMT on 14030, 21030 on c.w. or 14300 or 21400 on s.s.b. Every now and then 7 mc. *(Tnx WA6MWG).*

*Box 35, Hazlet, New Jersey 07730.

SSB HONOR ROLL

IT2HP	305	W3MAC	282	G2BVN	264	W3VSU	235
NØQVZ	305	W1LLF	282	G3DO	260	OZ7FG	234
K4TJL	305	W6UOU	282	W4RLS	260	W4HUE	231
W2TP	305	W3KT	282	W6WNE	260	W3DJZ	231
W2BXA	304	I1AMU	282	PJ2AA	258	W2PTM	231
G3AWZ	303	W2RGV	279	KP4CL	256	WA2EOQ	229
W2ZX	302	K4HYL	277	K6CYG	252	W6ZJY	228
5Z4ERR	301	DL1IN	276	K6LGF	251	W3FWD	226
W8PQQ	300	HB9TL	276	W1AOL	250	K1SHN	224
G8KS	298	PZ1AX	275	W4OM	249	K2JFV	223
K2MGE	297	W4SSU	274	W4PAA	249	K4JEY	221
W3NKM	296	W6RKP	274	W4NJF	248	W2MJ	215
W2FXN	294	K9EAB	274	GM3JDR	247	SM5UF	209
W4OPM	291	W2LV	271	XE1AE	247	WØQLX	206
W2VCZ	291	G3NUG	270	W7CMO	246	W5KC	206
K1IXG	289	K8ONV	270	YV5AFF	240	W6USG	204
K8RTW	288	G2PL	266	W7DLR	239	KØUKN	202
WA2IZS	288	W6YMV	265	K1JMV	236	ZS6YQ	202
						G3HDA	200

This happy looking gentleman is Joe, 5N2JAB. Joe looks for stateside stations on s.s.b. daily between 1700 and 2300 GMT. 20 meters preferred. (Tnx W2QJP).

The following certificates were issued between the period from December 6th, 1965 to and including January 5th, 1966:

CW-PHONE WAZ

2126	K5QVH	Hurley O. Saxon
2127	DJØKQ	A. B. Hubbs
2128	W9TMU	Maryan W. Plaza

ALL-PHONE WAZ

323	WA2EOQ	Cornelius C. Unruh

TWO-WAY SSB WAZ

364	WA2EOQ	Cornelius C. Unruh
365	XE1CE	Carlos Gonzalez Najera, Sr.
366	K6HZP	Joel E. Clark

CW WPX

699	G3OCA	Ken Frankcom
700	VE3DEB	Joseph Bebenek

SSB WPX

227	K6CYG	S. C. Shallon

MIXED WPX

117	DJ7XC	Erich Henke
118	K1LWI	F. Wendell Boyden, Jr.

KS4 Swan Island: WØYKD/KS4 now has a v.f.o. Mostly active around 14075 c.w. and 14255 or 14335 s.s.b. KS4AB is also active on 40 meter c.w. around 0500 GMT. *(Tnx VERON).*

LA/P Svalbard: LA4FG/P on 14040 kc at 1730 GMT. *(Tnx LIDXA).*

LH Bouvet Island: There will be a South African weather expedition to this island sometime during 1966 and ham radio is a possibility.

LZ Bulgaria: Mitko, LZ1BZ, on 14224 s.s.b. between 1230 and 1430 GMT. *(Tnx LIDXA).*

OD5 Lebanon: OD5EE on 14060 kc from 1400 GMT. He may have skeds so listen first. *(Tnx WGDXC).*

TN8 Republic of Congo: TN8AF on 14035 kc at 1900 GMT. *(Tnx LIDXA).*

UF6 Georgia: Here is a good one for the 80 meter DX buff. UF6UB is very active on 3605 s.s.b. starting at 2000 GMT. *(Tnx DX-MB).*

VP2 Anguilla: John, FG7XT, will visit here in May. *(Tnx LIDXA).*

VP2S Saint Vincent: VP2SJ is often active on 14050 kc from 1330 GMT. QSL Harold direct. *(Tnx WGDXC).*

VP5 Grand Turk: VP5RB, Bob, occasionally on 14230 kc at 0000 GMT. *(Tnx LIDXA).*

VR6 Pitcairn Island: Thanks to the efforts of John, W4TAJ, and Bob, W5OLG, arrangements have been made with Hallicrafters to send a complete sideband station to Tom Christian, VR6TC, on Pitcairn Island. Tom received an HT-37, HT-41 and SX-117 and commenced his sideband activity in February. John and Bob have also enlisted the cooperation of Hy-Gain and Tom should be putting out a walloping signal with his new equipment and a TH-3 tri-band antenna.

VR6TC is expected to be very active on both 15 and 20 meters most days except from 2200 GMT Fridays to 2200 GMT Saturdays, which is his Sabbath. Once the equipment has arrived, John and Bob will be in a better position to furnish frequencies and times when Tom will be most available.

QSLs for VR6TC should go to John Maddox, W4TAJ, 1403 Woodside Drive, Johnson City, Tennessee, with GMT and s.a.s.e. requested.

VS9K Kamaran Island: VS9ARV, VS9AFR, and VS9ADF, may operate as VS9KRV March 4th through March 14th. Listen on 14009 and 14160 kc. *(Tnx WGDXC).*

WS6 American Samoa: This rare prefix belongs to Barry Taaff who is a newly licensed novice on Samoa. He operates on 7158 and 7180 kc. Monday through Thursday between 0600 and 1100 GMT.

YI Iraq: Gus, W4BPD, has a license and may operate here in the near future.

ZB2 Gibraltar: ZB2AJ often on 14233-40 kc from 1200 GMT. *(Tnx WGDXC).*

ZL Campbell Island: ZL4CH is now active on Campbell Island. Try 14060 or 14110 kc between 0730 to 0930 GMT. *(Tnx VERON).*

ZS3 Southwest Africa: ZS3B, Jerry, on 14280 kc at 1900 GMT and ZS3HT, Herb, on 20360 kc about the same time. *(Tnx LIDXA).*

ZS8 Basutoland: ZS8K, Doug, on 14218 s.s.b. around 2030 GMT. *(Tnx LIDXA).*

9Y4 Trinidad: As you can see, there has been a change of prefix for Trinidad. 9Y4RS and

Frank, W5OJZ, doing a little repair work in Viet Nam. See the column for additional details. You might remember Frank better as KR6LJ or KG1AQ.

Shige, JA8ADQ, has been looking for Zone 8 since 1963 to complete his WAZ. A QSO and fast QSL from KV4CI did the trick. This once again proves the old DX adage "One man's DX is another man's QRM."

Rol, SM1CXE, provides the only SM1 s.s.b. QSOs from this neat, compact station. (Tnx VE3-9301)

9Y4TX both active on 20 s.s.b. *(Tnx VERON).*

3W8 Viet Nam: MARS is now open here in Viet Nam. Calls on MARS channels are the usual, beginning with Al 8 AIR etc. Can be heard phone patching at 2300 GMT daily direct to USA. Presently, there are five active stations all working 14,405 kc, etc. (20994, 6997.5) s.s.b. and c.w. from this end. Frank, W5OJZ/KR6LJ, passes along the above.

7Q7 Malawai: 7Q7GN will soon be on 20 meter phone as WB6ROA and wants to be sure everyone with whom he had a QSO as 7Q7GN gets a QSL card. Those still short cards from Gordon should write to him at 5628 North Lafayette Avenue, Fresno, Calif. 93705.

9M4 Singapore: Bob, 9M4LP, passes along the following: "My cards are now being handled by W2CTN. I heard Jack coming through on 40 meters recently with a tremendous signal and couldn't resist giving him a call and during the course of the conversation he asked if I needed a QSL manager. By coincidence, I had just reached the point where the cards were beginning to get the best of me and I could no longer do them justice, so I jumped at the chance.

"A couple of days ago I worked JA6AK, one of the JA's who has been active on 160 meters and asked him if he had worked any new DX on the band recently. To my surprise he informed me that all JA 160 licenses expired on December 31st and were not renewed. Apparently the JA amateurs were causing some interference to the Japanese Loran, and the idea of the spot frequency of 1880 was not very satisfactory for the amateurs anyway. A new plan has been put forward to let them operate between 1995 and 2000 kc and Ikuo thinks this will be adopted and that they will be back on the air by March (unfortunately thus missing the *CQ* 160 contest). He asked me to QSP this information to the Americans.

"160 has been fabulous between here and Europe this winter with many stations being received S8 and 9. Because of only being home a few days of each month and being unlucky in missing the good openings, I have only made two contacts so far with G2PL and G3FPQ (whose s.s.b. I heard also). However, I have heard a total of 25 stations on the band since mid November including 3 DLs, 14 Gs, 20 Ks, EI9J, 4U1ITU, 9L1HX, 9M4MT and 9M6BM. Conditions went to almost nothing during the week from Christmas to New Year, but the last couple of days the band has been wide open again. I plan to be home for the *CQ* 160 contest later this month and hope that conditions will be good until then."

Certificates

The "South East Asia Net" meets daily on 14320 kc s.s.b. Many amateurs may not be aware of the fact that the net offers an attractive certificate free to any amateur who contacts and exchanges reports with 12 of the net members outside of net times.

Claims should be sent to 9M4MT, Flt. Lt. Pain, Box 777, Singapore, with 4 IRCs to cover postage, etc. Only details of the contacts and reports are required.

Active members of the SEA Net are: HS1AK, CB, HS, S; HL9TD, TM, TT, KF; KR6CS, CR, EC, EO, OJ, TW, UD, UL; VK2AOK; VK3DH, OZ; VK9DR; VS6AJ, EK, FM, FO, UA; VS9-AFR, AWR; VS9MB, MP; XW8AL, AX, AY, AZ; 4S7IW; 9M2DQ, JR, LO, SR; 9M4ME, MF, MT, MU; 9M6AC, AP, DG; 9M8DR, DS; 9N1MM. *(Tnx to 9M4MT).*

Long Island DX Association's Second Annual DXCC Contest

"All the DX you can work in a year" is once again the object of the Second Annual DXCC Contest being sponsored by the Long Island DX Association in order to stimulate DX activity throughout the world.

The Contest began at 0001 GMT, January 1, 1966 and will end at 0000 GMT, December 31, 1966. Contestants will be required to work as many different countries over 100 as possible in order to be eligible for the special prizes which will be offered by the LIDXA. Any mode and any band may be used but just one confirmation from each country will count. The contest will be based on ARRL DXCC rules and the ARRL Countries' List will be followed.

The prizes to be awarded to the winners include the Long Island DX Association trophy, going to the top scorer in the world; five unique trophies, one to be awarded to the top scorer on each of the continents other than the winner; and individual certificates to be awarded to the top scorers in each country from which entries are submitted as well as winners in each of the USA, Canadian and Australian districts.

At the close of the contest, participants will be required to submit just this list of confirmed countries worked to the LIDXA Contest, P.O. Box 599, Lynbrook, New York, with postmarks no later than February 15, 1967. Potential winners will be notified and will be requested to submit all their Contest QSLs to the Contest Committee whose members are Dorothy Strauber K2MGE, and Marv Fricklas, W2FGD. A complete list of winners will be published as soon as the committee has completed the tabulation of the entries. For any additional information, contact the LIDXA Contest Committee members via P.O. Box 599, Lynbrook, N. Y. It is anticipated that the Third Annual LIDXA Contest to commence in 1967 will have rule changes to maintain the high level of interest displayed in 1965 and expected again this year. Proposed changes for the Third Annual Contest are already under consideration and will be announced shortly.

4U5ITU with G3OOH at the key. This is the 160 meter setup which provided quite a stir on top band. (Tnx W1BB)

DXpedition of the Month

Effective immediately all activity of the DXpedition of the Month will be transferred to New Jersey. The new address is: Stuart Meyer, W2GHK, P.O. Box 7388, Newark, New Jersey, 07107, USA.

Stu, W2GHK, will continue to direct this program and the activity will be expanded to include QSL Manager service for a number of stations around the world. In addition more country operations will take place.

All outgoing cards will be sent to the appropriate bureaus except those that are accompanied by s.a.s.e. or s.a.e./IRCs. These will be mailed direct. Hams outside the US may use the appropriate number of IRCs for surface or airmail as desired.

Arrangements have been made to forward all mail received in New York to the New Jersey address.

73, Urb, W2DEC

This modern looking station is none other than 9Q5AA. If you would like to hear it on this end, listen on 14115 kc between 0600 and 0700 GMT and 2000 and 2100 GMT.

QTHs and QSL Managers

AP2AD	Ahmed Ebrahim, POB 65, Lahore, West Pakistan.
EA9IC	Box 220, Madrid, Spain.
HBØXCU	via I1RB.
HBØYS	via HB9YS.
HM2BD	via WA6-MWG.
M1N	via W6JFJ.
OD5EE	John Garrett, Box 3, Beirut, Lebanon.
PJ5BC	via KØGZN.
KJ6DA	via WA6OET.
KS4AB	via WA9LCY.
SVØWAA	c/o American Embassy (ATO) APO N. Y. 09223.
SVØWDD	via W6OVV.
TT8AW	via W1BPM.
VK4TE	Between May 8, 1965 and June 7, 1965 via W8ZCQ.
VP2LS	via VE3EUU.
VP2SJ	via VE4OX.
VP5RB	via W4RK.
VQ9TC	Box 191, Mahe, Seychelles.
W7FKS/KH6	via W7LVN.
W7UJ/KH6	via W7LVN.
WØYKD/KS4	via WA4PXP.
WS6BW	Barry Taaffe, c/o Steinbaugh Dept. of Education Pago-Pago, American Samoa 96920.
XE5L	via W2SAW.
ZD7IP	(USA only) via K2HVN, 860 Atlantic St., Lindenhurst, L. I., N. Y.
ZF1BP	via VE3CJ.
ZL4CH	via ZL2GX.
ZS3HT	via WB2NQR.
5R8AS	via W6ZPX.
GW8CW	via W2VCZ, Box 15, Ramsey, N. J.
9K2AN	Nasir Kahn, Box 736, Kuwait.
9M2AE	via K6HZP.

Contest Calendar

BY FRANK ANZALONE,* W1WY

CALENDAR OF EVENTS

March	5-6	YL-OM C.W. Party
March	12-13	ARRL DX Phone
March	19-20	RSGB BERU
March	19-21	Missouri QSO Party
March	26-27	ARRL DX C.W.
April	1-15	Goose Bay QSO Party
April	2-3	Florida QSO Party
April	2-3	SP DX C.W.
April	**16-17**	**CQ WW DX SSB**
April	23-24	PACC CW/Phone
April 30-May	1	OZ CCA C.W.
April 30-May	1	HELVETIA 22
May	**7**	**CQ Spring VHF (12 hour)**

YL/OM C.W. QSO Party

Starts: 1300 EST Saturday, March 5
Ends: 2400 EST Sunday, March 6

The phone section is all over but you fellows can still take a crack at the C.W. Party and check the YLs' code speed.

W5RZJ gave all the details in her January YL Column.

Mailing deadline for your logs is March 21st and they go to: YL/OM Contest, Att: Edie McCracken, K1EKO, P.O. Box 285, Westwood, Mass. 02090

ARRL DX

Phone: March 12-13 **C.W.:** March 26-27

Starts: 0001 GMT Saturday. Ends: 2400 GMT Sunday in each instance.

This is the second half of the ARRL annual Marathon.

We gave you a brief run-down on the rules in the January CALENDAR, *QST* had full details in their Jan. issue.

Mailing deadline is April 23rd, the address: ARRL Communications Dept. 225 Main Street, Newington, Conn. 06111

BERU

Starts: 0001 GMT Saturday, March 19
Ends: 2359 GMT Sunday, March 20

Just a final reminder to our friends in the British Commonwealth. This is a contest open only to them. The rest of us will have to standby and drool when we hear those exotic prefixes that usually show up in this contest.

Mailing deadline for logs is April 12th and they go to: RSGB Contest Committee, 28 Little Russell Street, London, W.C.1, England.

Missouri QSO Party

Starts: 1800 GMT Saturday, March 19
Ends: 0500 GMT Monday, March 21

This is the 3rd Missouri QSO Party sponsored by the Northwest St. Louis Amateur Radio Club.

There is no time limit or power restrictions, and the same station can be worked on more than one band, phone or c.w., for additional contact credits.

Exchange: QSO number, RS/RST and QTH; county for Missouri stations, state, province or country for others.

Scoring: 1 point per contact for Mo. stations, total contacts multiplied by the number of states, provinces and countries worked. Out of state

Some 1965 Contest Results

PACC C.W.
USA and Canada

WB2KHV	3	W7BTH	75
W4SNU	576	VE1AE	12
W4HOS	90	VE4ZX	18

French C.W.

United States

W1GOG	3,132	WA4QPV	60	W8DWP	105
W1CSP	102	WA4EPM	12	W9LKI	1,980
K2SHZ	10,296	W5LGG	2,511	WA9GYZ	432
WA2KSD	4,428	W5WZQ	960	KØARS	1,584
W2AZS	1,764	W5HTM	612	WØVBQ	896
K2JFV	1,638	W5HDS	360	WAØEMS	168
W2GKZ	1,584	WA6SBO	1,680	WØAUB	147
K2DBN	450	W6MSM	1,482		
W3AYS	5,616	K6CYG	330		
W3KPI	969	W7BTH	1,425		
K3FNQ	810	W7LVI	714		
W4SNU	3,306	W7ABO	300		
W4LVV	1,311	W7VCB	300		
K4OBM	1,020	W8VSK	17,388		
W4HOS	243	W8JIN	12,045		
K4RQE	108	W8EVZ	1.794		

No. America

HI8XAL	108
VE2NV	14,268
VE2AFC	1,252
VE3AAB	1,071
VE8BB	3
VO1AW	3,348
XE1PJ	27

H 22 Contest

United States

W1TX	5712	WA3COJ	1125	W6UMI	192
W8VSK	4743	W4HOS	960	W1YFM/7	192
W1EVT	3904	W1UOT	900	K4EJ	147
W4SNU	3726	W8YGR	864	K9RDY	144
W1WY	3675	WA8HOM	792	WA5IIS	126
W1BHV	1767	W2RA	702	KØYIP	126
K6AHV	1728	K9VBC	648	K1IJU	108
W5WZQ	1710	W9UX	648	K3KMA	75
W5LGG	1680	W7PQE	561	K5JVF	48
W8JIN	1596	W7BTH	561	WA2UDT	27
W7LVI	1428	W4XSH	528		
W3MSR	1428	W4OMW	420		
W2QKJ	1428	WA6VAT	390		
K4OBM	1365	W7DIS	390		
K9EAB	1344	WAØKDI	363		
W3UVH	1200	W9WIO	360		
W8NAN	1176	W5LRY	330		
K2UYG	1152	WØGNX	288		
KØIKL	1125	K1OOOV	270		

North America

KP4RK	468
VE1EK	780
VE1AE	360
VE4ZX	324
VE3BWY	297
VE2IL	105

*14 Sherwood Road, Stamford, Conn. 06905.

stations; 2 points for each Mo. contact, total contact points multiplied by the number of different Missouri counties worked. (A maximum of 115 possible)

Awards: A certificate to the highest scorer in each state, Canadian province and foreign country. (Minimum of 5 contacts) And to the top 5 stations in Missouri. There will also be awards to the 3 highest scoring clubs in the world.

Frequencies: c.w.: 3520, 7025, 14050, 21050.
phone: 3950, 7225, 14330, 21350.

Mailing deadline is April 30th. Send log with a s.a.s.e. for results to: Paul Haefner, KØJPL, 1939A East Warne Ave., St. Louis, Missouri 63107.

Goose Bay QSO Party

Starts: 0001 GMT Friday, April 1
Ends: 2359 GMT Friday, April 15

This party sponsored by the Goose Bay Amateur Radio Club, extends over a period of two weeks to give everybody an opportunity to work the VO2s for the WAG, Worked All Goose award.

The boys promise to be on in full force, so look for them on all bands and modes, except RTTY.

Exchange: RS/RST report, name and QTH.

Awards: Stations in the USA or Canada contacting at least 4 members, all others 3 members, during the party will be eligible for the WAG award.

QSL cards are required as proof of contact. These cards can be sent along with your application and they will be checked against member logs. There is no charge for the award if all contacts are made during the QSO Party.

Mail all applications and cards to: G.B.A.R.C. Party, P.O. Box 232, Goose Bay, Labrador, Canada.

Florida QSO Party

Three Periods:
1400-2000 GMT Saturday, April 2
0000-0500 GMT Sunday, April 3
1400-2000 GMT Sunday, April 3

All amateurs are invited to participate in the Florida QSO Party sponsored by the *Florida Skip* Magazine.

There are no power restrictions or time limits, and the same station can be worked on each band for contact point credit. Phone and c.w. are separate contests and scored separately.

Exchange: QSO number, RS/RST and QTH; county for Florida stations, state, province or country for all others.

Scoring: Florida stations: 1 point per QSO multiplied by number of states, Canadian provinces and countries worked. (Other Florida stations may be worked but only for contact points, no multiplier, except as a state, and WAFC credit.)

Other stations: 1 point per QSO multiplied by number of Florida counties worked. (Maximum of 67). In addition, bonus points for working Florida counties as follows: First 20, 50 points; second 20, 200 points; third 20, 500 points; all 67 counties, 1500 points.

Awards: Certificates to the highest scoring station in each state, Canadian province and each foreign country. (With 5 or more contacts.) And each Florida county.

Frequencies: CW-1815, 3530, 7030, 14030, 21030, 28030, and 145.2. Phone: 3930, 7230, 14230, 21330, 28830 and 50.230.

All logs must be postmarked no later than April 30th and sent to: *Florida Skip,* Contest Chairman, P.O. Box 501, Miami Springs, Fla. 33166.

SP DX C.W.

Starts: 1500 GMT Saturday, April 2
Ends: 2200 GMT Sunday, April 3

It's the world working the Polish amateurs on c.w. only in this one. Some slight rule changes are expected which we hope to have in time for next month's CALENDAR.

CQ WW DX SSB

Starts: 1200 GMT Saturday, April 16
Ends: 2400 GMT Sunday, April 17

Complete rules will be found on page 30 of this issue. We were debating making some slight modifications in the rules, but since the response to our invitation for suggestions was so small we thought it best to leave good enough alone. The compulsory 12 hour rest period, which can be divided into 2 periods any time during the contest, is being retained. As also is the ruling of counting a prefix only once regardless of different bands used.

Editor's Notes

We want to apologize for the long delay in the publication of the results of last year's SSB Contest.

What with the many Gemini projects that took him out of the country for weeks at a time, moving to a new QTH and a short bout of illness, Bob Stankus, W2VCZ had his hands full.

We promise you it will not happen again.

73 for now, Frank, W1WY

DON'T FORGET . . .

There's still time to make plans to enter the CQ World Wide SSB Contest. Check off the dates April 16 and 17 and send away now for the log forms.

HAM CLINIC

CHARLES J. SCHAUERS,* W6QLV

"I've checked every tube and part in my set and they are okeh, but yet my set does not operate the way it should. A friend has the same set and has experienced no trouble whatsoever.

"The manufacturer has been of little assistance and finally suggested after the exchange of a number of letters that I ship the set to the factory. Can you offer any help or suggestions before I heave the set out the nearest window or send it back to the factory for one last try?"

This letter may sound *unusual* but it is by no means the only letter of its kind that HAM CLINIC has received.

Unusual Troubles

A tube may check out fine in a tube tester; a capacitor may exhibit no leakage or other undesirable condition on a good reliable checker; a resistor when checked with a good ohmmeter may check out right to the ohm and other set components may test out perfectly when disconnected from their respective circuits, but believe me, this does not mean that they will always operate properly when subjected to various voltages, currents and vibration.

Perhaps you have taken voltage and current tests when the set was nearly cold or after it has been operating for two hours or more and these tests showed the measurements to be within the tolerable limits set by the manufacturer. Now what to do?

There is no doubt about it, finding the cause of an illusive trouble can be mighty frustrating. But if one keeps in mind the fact that the *unusual* troubles generally stem from component failure *under operation*, your troubleshooting attack will be a bit more careful.

"My receiver works fine for about two hours and then it simply quits. When I flip the on-off switch a couple of times the set operates again for another two hours or so. All tubes and other components check out okeh. What do I look for?"

I would say that this question has been received from at least 100 readers. My first encounter with this intermittent trouble was in 1933 in a Philco bc receiver. After many frustrating hours I finally located the trouble—merely a coupling capacitor between the second detector and the first a.f. stage. For some unknown reason this capacitor checked out fine but it would open up at odd times. The easiest way to find such an intermittent capacitor is to bridge coupling capacitors with a good capacitor.

Then there was the case of the set that started out fine and as it operated the volume would drop until nothing came from the loudspeaker. This was traced to a resistor that opened up after it got so hot. The resistor supplied screen voltage to the final a.f. amplifier.

A well known s.s.b. transmitter would develop carrier leak-through. Adjustment of the carrier balance pots would cure the condition for a little while, then no amount of adjustment would balance out the carrier. Tubes were changed, and all parts associated with the balanced modulator were checked out okeh. Replacing the carrier balance pots with 5 watt wire-wound jobs did the trick on a couple of the sets, but on two others this did not work. Heavier high voltage feed resistors were installed and the set settled down. On the *same* set one owner experienced distortion but all of his tests were normal. He sent the set to the factory and it checked out fine there. The trouble? A bad microphone!

Sometimes the trouble is so minute that it is never suspected. Take for example the receiver that drifted in frequency (an unusual occurrence in this set because the set is regarded as one of the most, if not the most stable manufactured). Voltages were checked, tubes and other parts associated with the oscillator tested out okeh. The owner was ready to give up until a friend who is a TV serviceman suggested that even though the oscillator tube checked out okeh why not try another one? He did, the set functioned perfectly.

Substitution of parts and tubes (or transistors) is always a good bet when there is little else left to do. But in replacing parts or tubes, use exactly the *same* replacements.

Most Unusual Troubles

In transistor circuits a little more or little less bias in some instances can upset operation. This may be caused by resistors that change value or it may be due to a thermoelectric effect. This is the effect where two dissimilar metals when heated can create electricity. For example, undesirable added voltage can be created when a copper wire is connected to or in partial contact with a nickel or nickel alloy wire and the junction is heated. About +12 microvolts are generated by an iron-copper junction per degree centigrade of temperature. With nearly pure nickel and copper, a —20 volts are generated. Finding the trouble caused by the thermoelectric effect is difficult, but it can be done if a v.t.v.m. is used properly.

In some circuits the thermoelectric effect may not stop operation but it may cause undesirable noise.

*c/o *CQ*, 14 Vanderventer Ave., Port Washington, L.I., N.Y.

Now when two dissimilar metals are very close together but not in active contact, and these two dissimilar metals carry voltage ionic action may take place (as it does in a battery)—especially if there is high humidity—and noise will be generated. Then because of this galvanic action there may be a transfer of metal from one connection to another and eventually one of the connections may be eaten away. That illusive "open" may be caused by electrolytic action in salt air environments. If a conducting deposit results, there could be a short especially between connections carrying very high voltage.

Vibration can cause a lot of trouble and it may come from transformer laminations (vibrating at 50-60 cycles), an improperly adjusted relay or even from the sound coming from a loudspeaker (if the speaker is mounted on the cabinet of a receiver).

Another effect that hams have heard little about is the so-called triboelectric effect. Voltages can be produced between insulation mediums of cables when the cables are in motion, i.e. coaxial cable moving in a strong wind. The voltages built up appear as noise and are *not* related to precipitation static that one sometimes encounters in stormy weather. Incidentally, this is a big problem facing space planners.

Equipment that is used in highly humid areas should be tropicalized as is most of the surplus equipment manufactured for the military and now available to hams. If it is not tropicalized then the equipment should be left *on* and never turned off to prevent the build up of humidity and usually a resultant fungus.

If ordinary troubleshooting procedures do not reveal the cause of a mal-function then by all means attempt to isolate as closely as you can the stage or stages affected, then try component substitution. But in any case, always look for the simplest and most likely causes of trouble *first*.

Questions

Super Pro Modifications (BC-779)—"Can you direct me to an information source that will tell me how to up-date my super pro receiver?"

Yes. Write *CQ* for a copy of the *Surplus Conversion Handbook* (Cat. No. 122), $3.00. This book contains all the information you can use on modifying the Super Pro. If you have the patience and time to make the modifications, I dare say that you'll come up with a set that will compare favorably with some of the most expensive receivers available today.

SCR-522 Conversions—"I have a couple of mint-condition SCR-522's. Where can I get the practical information needed to convert these?"

In the same book mentioned in the first question above.

Transceiver Selectivity Control—"I own a late model transceiver that works very well (Eico 753), but I would like to add a variable selectivity control. What kind would you suggest in this case?"

A "T" notch filter. See page 69 of the May 1964 *CQ*. If you do not have a copy of the article, write *CQ* (not me), enclose $1.00 for a reprint of the May 1964 column. This particular column contains a transistorized converter for 21 mc, a system of doubling in the output of the BC-696 and other interesting items.

100 Kc Oscillator With Tunnel Diode—"I have the need for a 100 kc sine wave oscillator, it should be a very simple one and have fair stability. I do not want to use a crystal. Preferably it should be a solid state device. Can you help me out?"

Yes. See fig. 1 for a tunnel diode sinewave oscillator using a General Electric ZJ69 TD. I built the oscillator and compared it to a crystal oscillator (100 kc)) I found that the little TD oscillator was rock steady as long as there were no drastic temperature changes. The sine wave output is nearly "perfect." The crystal oscillator however, was more stable and had a better long term accuracy.

Product Detector Definition—"Why is the detector used in s.s.b. work usually called a product detector?"

Because the output amplitude of the detector is proportional to the mathematical product of the amplitudes of both of its *two* inputs (carrier and modulating signals). It is often called a demodulator too. Because the carrier is suppressed it is often termed a form of a balanced modulator also.

a.m. Equivalent Mode—"Please tell me what a.m.e. stands for and what is it? Where can I get more information on it? I understand that it has something to do with being able to receive it on either an s.s.b. or a.m. receiver."

A.m.e. stands for amplitude modulation equivalent and it is sometimes referred to as c.s.s.b. (compatible sideband). In a.m.e., a *single* sideband is transmitted along with a carrier of constant amplitude. The carrier suppression is usually standardized at a —6 db, although other standards may be encountered. An a.m.e. signal can be received on either an s.s.b. or an a.m. receiver. For more information on a.m.e., s.s.b. and a.m., I recommend the booklet, *A Qualitative and Quantitative Analysis of the AM, SSB and AME Modes of Operation of Radio Equipment* by William P. Henneberry ($1.00 from the Technical Material Corporation, 700 Fenimore Road, Mamaroneck, N. Y.). This 40 page book, well illustrated with spectrum analyzer

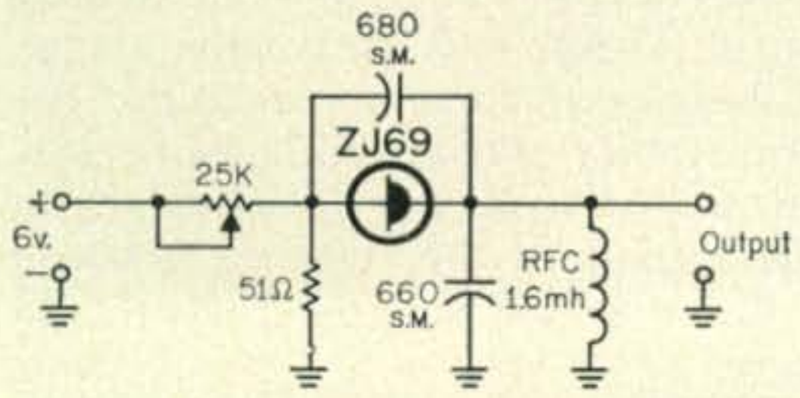


Fig. 1—A 100 kc sine wave oscillator having good output waveform. The tunnel diode is a G.E. ZJ69.

patterns, formulae and good concrete information on the subjects covered will give you or anyone interested in the analysis of a.m., s.s.b. and a.m.e. a full exposure. I recommend it to hams, radio-electronic students, technicians and engineers.

Use Your 304TL's—"I acquired a number of 304TL tubes. Any good information about concerning their use?"

Yes, see the August 1950 issue of *CQ*, in it is an article entitled "Use Your 304TL's." Reprints from the Editor of *CQ* at $1.00.

BC-458 and BC-459 to 21 Mc—"In what issue of *CQ* did information appear on putting the BC-458 and BC-459 on 21 mc? It seems to me an article on this came out sometime in 1951 or 1952."

See the August 1952 issue of *CQ* for the article, "On 15 Meters—Quick by W2CTE." Article reprint from the *CQ* Editor, $1.00.

Ham School—"Can you direct me to a school in the Los Angeles area that teaches ham radio from the bottom up in a methodical manner so that I may obtain a ham license? I'd like to go to an evening school where I can obtain code training as well as the theoretical. Can you recommend one to me? I want nothing expensive."

Yes. Write to the Ron Reed Electronics Inst. 12217 Santa Monica Blvd, West Los Angeles, California (90049). This school has the course you are looking for. The cost? About $135.00 or $150.00 in time payments.

Transistorized Polar Converter—"Where can I obtain information on the construction of a transistorized polar converter that I need for my teletype work?"

Suggest you get a copy of *The New RTTY Handbook* by Byron Kretzman (obtainable from *CQ* for $3.95); in the book you will find what you are looking for and much, much more if you are interested in radio teletype.

90 Ohm Coaxial Cable—"I obtained a lot of 90 ohm coax cable on the surplus market. Any way to use it with a vertical antenna that requires a 45 to 50 ohm match?"

Try paralleling two of your 90 ohm coax cable pieces. Make sure they are of the *same* length. By paralleling them you'll come out with about 45 ohms or so.

SR-150 Transceiver on a.m.—"I own an SR-150 transceiver and like it very much but I'd like to be able to work a.m. stations too. Any way to convert or modify the set to do this and still retain the s.s.b. and c.w. features?"

The set uses a good product detector, merely removing the b.f.o. injection results in no signal at all. You would have to install a switched diode detector of some sort. Injecting carrier by modulator unbalancing is not recommended. Further, the power output on a.m. would be less than a quarter of what it is on s.s.b. or c.w. The modification can be done there is no doubt about it, but I do not have the step-by-step information. Anyone out there help us?

SB-10 Transistorized—"I understand that the popular SB-10 s.s.b. exciter by Heath can be transistorized. Is this true, and do you have the information?"

Nearly any set can be transistorized now except for high power r.f. finals.

To transistorize the SB-10 would take some astute design work and a lot of new parts. Any reader help us on this one (in detail)?

Handy Talkies on 28 Mc—"I found out that the walkie-talkie my son received for Christmas will work on 28 mc by merely inserting a 28 mc (overtone) crystal. Because the power is so small can my son use it on 28 mc instead of 27 mc to talk to me?"

How long have you had *your* license? The answer of course is *NO!* If your son has a ham license, yes. Incidentally, the misuse of CB walkie-talkies is receiving some notice in the U.S. *Do* tell the kids you see using them that they can get into trouble if they use obscene language on the air or create interference with other established radio services.

Equivalent Transistors for 2N301—"Are there any equivalent transistors for the 2N301 power transistor?"

Yes. These are: 2N301A, 2N257, 2N257B, G, & W, DS520 and SYL-109.

800 Cycle a.f. Oscillator—"Can you publish a diagram for an a.f. oscillator having an 800 cycle output? Please make it simple."

See fig. 2. Transistors may be any one of the following: 2N633, 2N369, 2SB101 or 2SB102. To bring the frequency *up, decrease* the value of the capacitors in the ladder network. This oscillator works FB.

Operating Maritime Mobile—"I am a crew member of a ship plying between the U.S. and other parts of the world. I was given permission to install my transceiver on board and when the regular ship's station is *not* working I get along fine, but the moment the ship's station starts up I'm swamped. I do not interfere with their working. What can I do?"

Perhaps nothing because of the strong r.f. saturation. On the other hand a receiver front-end crystal filter may be the answer to your problem. Suggest you obtain a copy of *Interadio (4U1ITU Calling)* the journal of the International Amateur Radio Club, P.O. Box 6, Geneva 20, Switzerland ($1.00). On page 60 you will

[*Continued on page 100*]

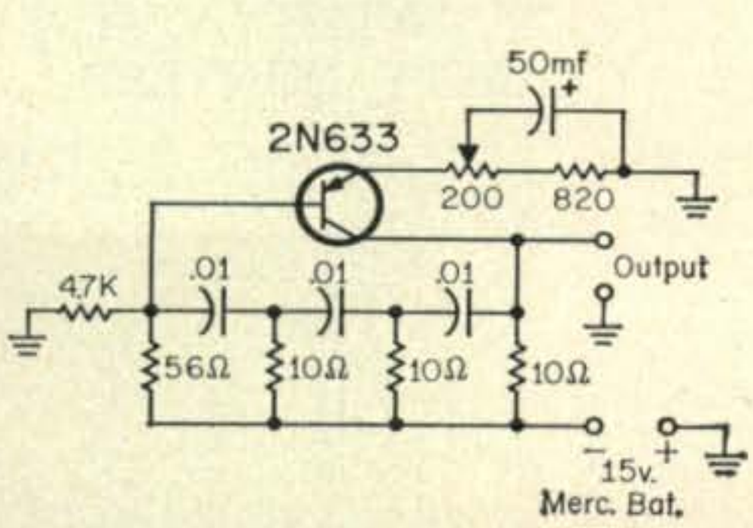


Fig. 2—An 800 c.p.s. oscillator. R should be adjusted for maximum amplitude with minimum distortion.

the USA-CA PROGRAM

BY ED HOPPER,* W2GT

THE *BIG* story of the month is that "Mack", W9ICF qualified for USA-CA-3000 Award #4, endorsed Mixed and received endorsements of Mixed, all 7 mc s.s.b. and all mobile for USA-CA-2500 Award #13; USA-CA-2000; USA-CA-1500; USA-CA-1000 and USA-CA-500 Award. Victor, WØGYM received USA-CA-2000 Award, endorsed mixed. Hugh, WA8CNN and Paul, WØPLN received USA-CA-1000 Awards. Bill, K3CRC received USA-CA-500 Award, mixed. Nelson, W4BHD and Jim, W6CUF both earned USA-CA-500 Awards endorsed all A-1. Louis, K8IXU won USA-CA-500 Award endorsed all 50 mc A-3, which is real tough and only the third one issued so endorsed.

W9ICF

Eugene L. McMurtry, better known as "Mack", started county hunting on 25 May 1964, when he checked into the 40 meter net (7223) to hand out "rare" Monroe County, Illinois to WØMCX. Most of his contacts have been on this 40 meter net, where Mack is often the NCS. The rig is located in his TV repair shop with an extension speaker over to the house 100 feet away. The rig is on from 7 A.M. to 5 P.M. and when he is not NCS, working counties, filling out QSL cards, keeping the Record Book, or fixing TV sets (in that order), he keeps the weather data for the U.S. Weather Bureau and organizes the local CB'ers into a Civil Defense Unit.

He also holds DXCC, WAC, WAS, WPX, EC, OO, OPS, RCC, A1OP and Public Service Awards.

Mack has done extremely well although not in the best of health and does not claim superior operating skill, phased antenna arrays, high power linears, quiet rural location nor lots of idle time in which to operate. His "secret weapon" is the 40 meter County Hunters Net. His antenna is a piece of wire 135 feet long, 35 feet off the ground, tied to a telephone pole at one end and a wooden tower at the other end.

As Mack likes to put it—county hunting is not like rabbit hunting—you don't just make up your mind one day that you are going to go out and get all the little "varmits". It can't be done without team work and cooperation. The 40 meter net is a giant human pyramid with each person pushing the guy above him with one hand while pulling up the guy below him with the other hand. It is the mobile operators like W4BPC, WØKZZ, W9HAT, K9BLX, K8YGU, K8CIR, K8IWI, W8UPH, K8VZW, K9VYL, K9TBY, WØMCX, WØJWD, WA5AEB, WØ-VFE, W9LKB/W6DSI, WA4NBC, K4VQP, W4AUZ, W8BZY, W3CTN, W5DAV, W9JS and many many others who daily and systematically put their own state on the map with their business trips and planned county expeditions. One of the big rewards of county hunting is the hundreds of nice people you meet and get to know and love. People who would and do drive hundreds of miles out of their way just to give you a county that you still need. YES, there is nothing to equal the fun of county hunting.

Letters

Al, K1QHP/1, writes: "Nope . . . did not forget you Ed, nor your deadlines, just a little red tape at my end . . . hope to have the ET3 certificates from the printer soon and will get one right off to you with a copy of the rules. Congrats on your interesting columns."

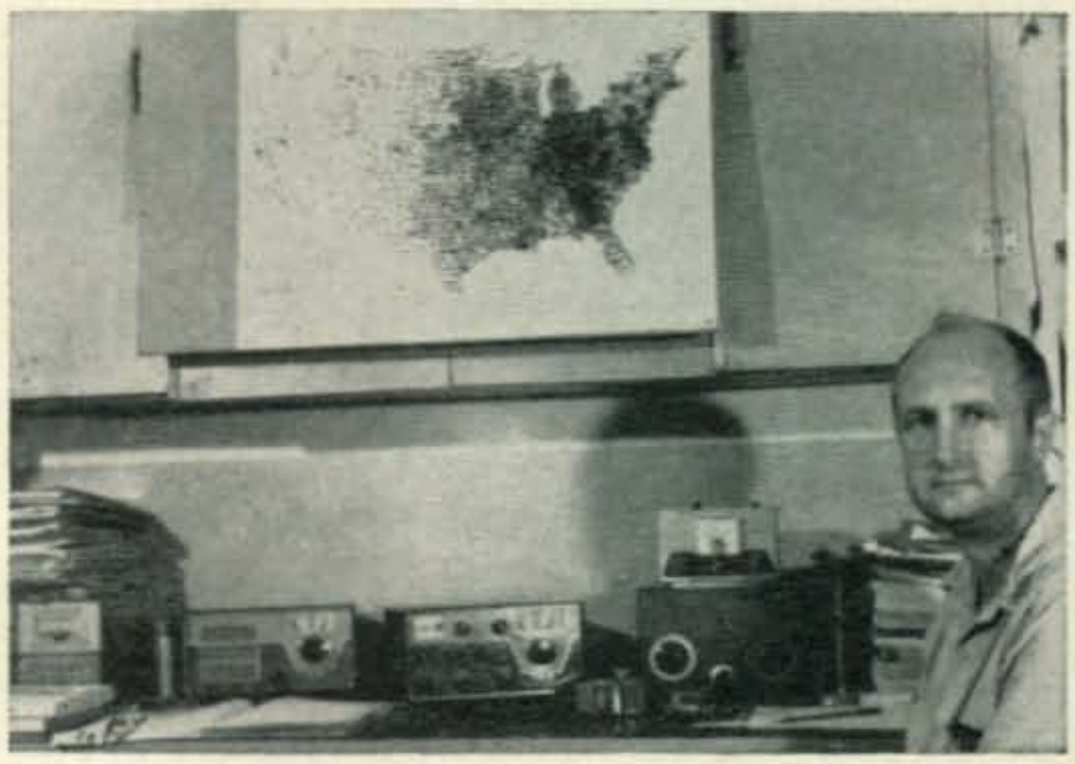
*103 Whittman St., Rochelle Park, New Jersey, 07662.

USA-CA HONOR ROLL

3000		1500		500	
W9ICF	4	W9ICF	44	W4BHD	539
2500		**1000**		W9ICF	540
W9ICF	13	WØPLN	91	K8IXU	541
2000		W9ICF	92	K3CRC	542
W9ICF	24	WA8CNN	93	W6CUF	543
WØGYM	25				

SPECIAL USA-CA HONOR ROLL TOP TWENTY-FIVE COUNTY HUNTERS

3079	**2900**	W9CMC
K9EAB	WA9AJF	**2180**
WØMCX	**2780**	K8VSL
3061	K8IWI	**2080**
K8CIR	**2679**	W5NXF
3050	VE3-9301	**2050**
W9ICF	**2562**	W2JWK
2960	WØKZZ	K3LXN
K5SGJ	**2500**	**2000**
K5SGK	K8KOM	K9UTI
2950	**2410**	W5EHY
WØJWD	WØVFE	WA8EZW
2944	**2368**	K8YGU
K4VOF	W8UPH	WØGYM



"Mack", W9ICF

WANSC Award

Worked HC

Worked All Wisconsin Counties

Graham, ZL1BDF, writes: "Could I prevail upon you to pass my congratulations along to Cliff, K9EAB and Art, WØMCX on their latest achievements. Although I am not an award-hunting man myself, I wish to pass my best for your continued success. Many people regard the USA-CA as the "Award to top ALL AWARDS." 73 & Best wishes."

Steve, WA4SQD, writes: "If you have not done so already, you might tell the fellows (and gals) that they can find the counties of the amateurs they work with the *Texaco Touring Atlas* which is available from any Texaco dealer for $1.95. I am an EE student at VPI and operate only on the long breaks between sessions at school. I am in the not-too-rare Chesterfield county and work mainly on 20 meter c.w."

Hugh, WA8CNN, writes: "Received my USA-CA-1000 Seal today, thanks. There are two readers of *CQ* magazine here Ed and my son, WA8HSB usually beats me to the mailbox. Then your section is "spot-read" to me before he takes off with it to finish the whole darn mag. *Then,* I get it!! He's awful proud of his USA-CA-500 Award #510. Many thanks and keep up the good work."

Bob, W8UPH, writes: "My confirmed county total to date is 2368. Keep up the good work and the excerpts from various letters you receive keep the interest in your column very high."

John, ZS5UP, writes: "First, thanks for the USA-CA column in *CQ,* sure good to get all this award information.

When I started ham radio in May 1961, my ambition was to get DXCC, WPX, BERTA and AAA. Took me seven months with my 40 watts to work the 100 for DXCC but QSLs were slow and award is dated Dec. 1962. BERTA and AAA soon followed but not until March 1965 did I get my WPX. Now have 89 awards, the latest being the very fine Japanese award for Worked All Islands.

My greatest hunt now of course is for USA-CA, but I guess my chances are pretty slim. The following table may be of interest and I have omitted stations worked during 1965 as perhaps there has been insufficient time for cards to arrive. I do genuinely QSL to *every* station for our first QSO and to *every* s.w.l.

Area	QSLs Sent	QSLs Recd.	% QSL Return	QSLs with County Identified
1	128	64	50	29
2	208	101	49	52
3	118	47	40	31
4	113	48	42	38
5	38	20	53	13
6	76	35	46	23
7	39	16	41	8
8	139	45	32	32
9	84	38	45	19
Ø	57	20	35	7
KH	14	4	29	3
KL	2	2	100	2
Total	1016	440	43	257

Only 43% QSL and of the QSLs received I have been able to identify the county on only 58% of them.

"As a comparison, I have worked 234 USSR stations with 160 QSLs received—a 68% return. What is this USA goodwill programme that I have heard so much about! Hi!

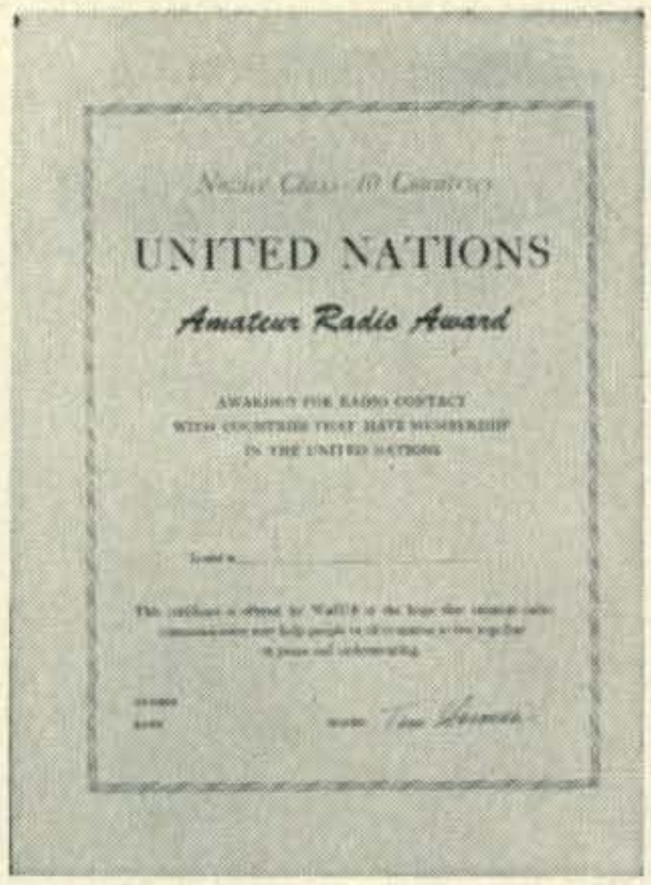
"Guess I would need some 5000 county cards to get 500 different counties. Only 58% identified, so would need 8620 QSLs. Only 43% QSL so I need 20,000 different US contacts.

"Had 1000 different ones in 4 years operating, so you can expect my USA-CA application in 2045 and by that time I shall be 121, Hi. I shall, of course, do my best to improve on this. Thanks again, Ed, for a most interesting column and I hope we may meet on the air one day."

(Ed. note—As I do not expect to be writing this column in 2045, a POD 26 has been sent to John, and perhaps his letter will help get some of the QSLs that are owed to him.)

"Emil", OK1AEH Winner of WAPUS Award Described in CQ Aug. '65.

Seasons Greetings "Award" of W4NOK/WA4NFA



The United Nations Award

The Finnmaid Award

QSO Parties

17th Annual YL-OM QSO PARTY, c.w. Section starts 1300 E.S.T. (1800 G.M.T.) Saturday, 5 March 1966 and ends at 2400 E.S.T. Sunday 6 March 1966. For complete details see CONTEST CALENDAR by Frank Anzalone, W1WY and YL column by Louisa Sando, W5RZJ in January *CQ*.

The Missouri QSO Party starts at 1800 G.M.T. Saturday, 19 March 1966 and ends at 0500 G.M.T. Monday, 21 March 1966. For complete details turn to CONTEST CALENDAR by Frank Anzalone, W1WY. (There are 115 counties in Missouri).

Awards

Zone Five Award: This was fotoed in *CQ* Nov. '65 and rules in Oct. '65, but the rules have a clarification/change regarding VO contacts. NOW required VO1-5, Two *CITIES* (not counties) one above and one below the 48th parallel. Of course there are now only VO1 and VO2 stations, but this award dates back to 1947. This change/clarification was brought about through the fine cooperation of Clarence, VO1AW. For any additional details, send s.a.s.e. to Awards Chairman, Canisteo Valley Amateur Radio Club, Hornell, N.Y.

Worked All Wisconsin Counties is sponsored by The Waupaca Amateur Radio Club, P.O. Box 161, Waupaca, Wisconsin. All contacts must have been made after January 1, 1958. Rules for all stations within the continental U.S.A.: A certificate will be issued when 40 Wisconsin counties have been QSOed and confirmed, additional stickers are available when 60 and 72 counties have been QSOed and confirmed. Send check list showing stations QSOed and signed by two amateurs confirming QSOs and QSLs. Send $1.00 for certificate, endorsements for 60 and 72 counties are free. Rules for stations outside the continental U.S.A.: A certificate will be issued when 10 counties in the state of Wisconsin have been QSOed and confirmed. Additional stickers are available when 20-30-40-50-60 and 72 counties have been QSOed and confirmed. Send check list showing stations QSOed and signed by one amateur operator confirming QSOs and QSLs. Send 7 IRCs or $1.00 for certificate. Additional stickers are available for 1 IRC. A list of counties and copy of rules may be obtained for s.a.s.e.

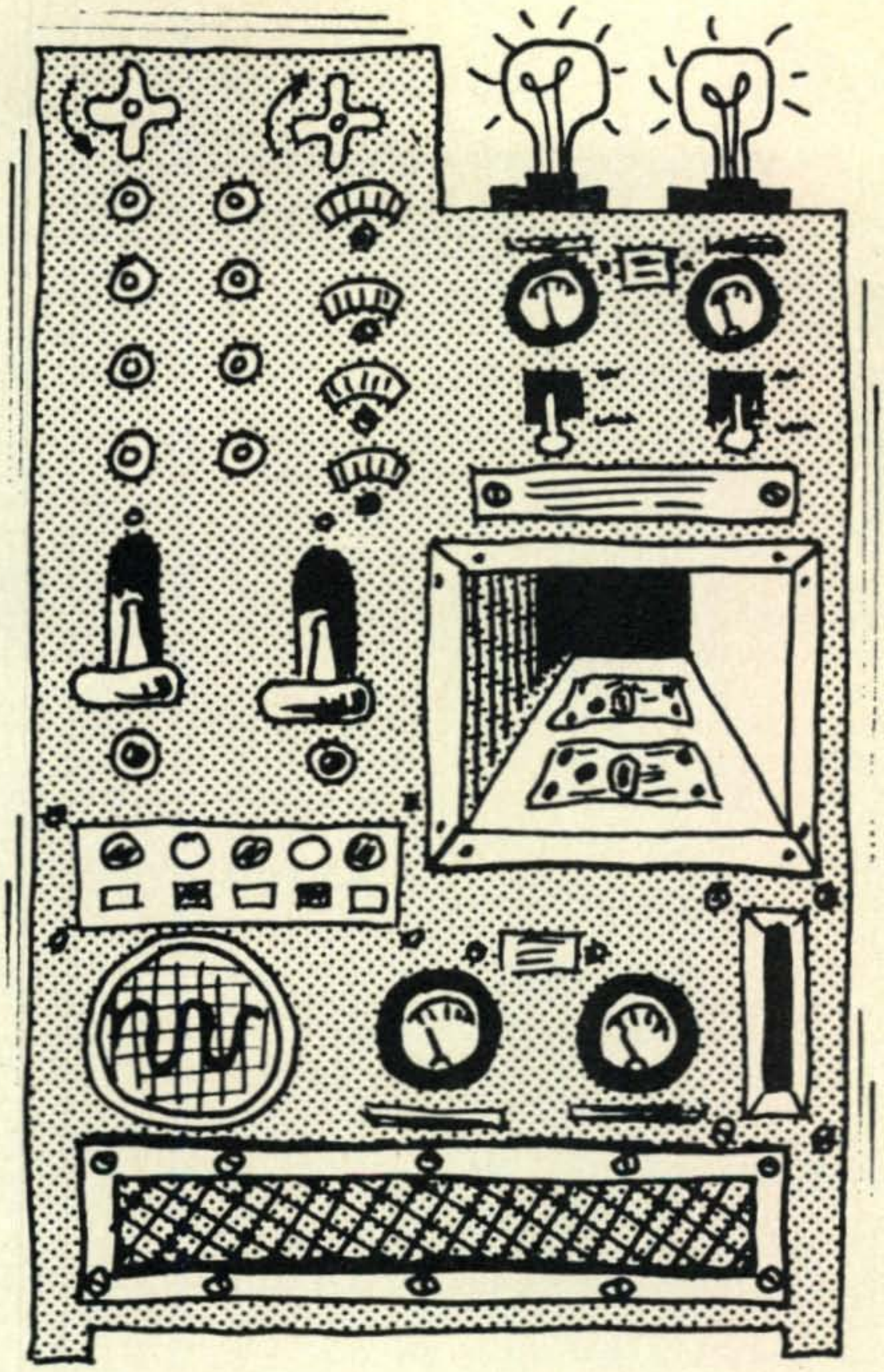
The United Nations Award is issued in 6 classes: *Champion,* 100 countries, *Expert,* 85 countries, *Class 1,* 70 countries, *Class 2,* 55 countries, *Class 3,* 40 countries and Novice Class (for Novice ops), 10 countries. Countries contacted must be nations having membership in the UN during the year they are contacted. UN countries are listed with the year they joined. Nations not on this list will become eligible when they join the UN. An alphabetical list of countries is required with application. QSLs are required but do not have to be sent. GCR applies, that is a statement by two radio amateurs or an officer of a radio club will be accepted in lieu of the cards. These awards are also offered to SWLs. Unless endorsements are desired, it is not necessary to send any information besides the year the country was contacted. Please sign your name and call plainly on all applications. Each diploma is numbered and is different from the rest in color. Cost of award is $1.00 or 7 IRCs, no charge for endorsements. The following countries may be worked for award:

Afghanistan	1946	Kenya	1963
Albania	1955	Kuwait	1963
Algeria	1962	Laos	1955
Argentina	1945	Lebanon	1945
Australia	1945	Liberia	1945
Austria	1955	Libya	1955
Belgium	1945	Luxembourg	1945
Bolivia	1945	Madagascar	1960
Brazil	1945	Malawi	1964
Bulgaria	1955	Mali	1960
Burma	1958	Mauritania	1961
Burundi	1962	Mexico	1945
Byelorussia (UC2)	1945	Mongolia	1961
Cambodia	1955	Morocco	1956
Cameroun	1960	Nepal	1955
Canada	1945	Netherlands	1945
Central African Rep.	1960	New Zealand	1945
Ceylon	1955	Nicaragua	1945
Chad	1960	Niger	1960
Chile	1945	Nigeria	1960
China (Formosa)	1945	Norway	1945
Columbia	1945	Pakistan	1947
Congo (Brazzaville)	1960	Panama	1945
Congo (Leopoldville)	1960	Paraguay	1945
Costa Rica	1945	Peru	1945
Cuba	1945	Philippines	1945
Cyprus	1960	Poland	1945
Czechoslovakia	1945	Portugal	1955
Dahomey	1960	Roumania	1955
Denmark	1945	Rwanda	1962
Dominican Republic	1945	Saudi Arabia	1945
Ecuador	1945	Senegal	1960
Egypt	1945	Sierra Leone	1961
El Salvador	1945	Somalia	1963
Ethiopia	1945	South Africa	1945
Malaysia	1957	Spain	1955
Finland	1955	Sudan	1956
France	1945	Sweden	1946
Gabon	1960	Syria	1945
Ghana	1957	Tanganyika	1961
Greece	1945	Thailand	1946
Guatamala	1945	Togo	1960
Guinea	1958	Trinidad-Tobago	1962
Haiti	1945	Tunisia	1956
Honduras	1945	Turkey	1945
Hungary	1955	Uganda	1962
Iceland	1946	Ukraine (UB5)	1945
India	1950	USSR	1945
Indonesia	1950	United Kingdom	1945
Iran	1945	USA	1945
Iraq	1945	Upper Volta	1960
Ireland	1955	Uruguay	1945
Israel	1949	Venezuela	1945
Italy	1955	Yemen	1947
Ivory Coast	1960	Yugoslavia	1945
Jamaica	1962	Zanzibar	1963
Japan	1956	Zambia	1964
Jordan	1956		

Send application and fee to Tom Harmon, WØIUB, 1629 Pleasantview, Wichita 3, Kansas.

[*Continued on page 100*]

HOW TO MAKE MONEY!



Use this money-making machine? A good idea, but Uncle Sam holds the patent ! ! Discouraged? Don't be . . . Try this—

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Propagation

BY GEORGE JACOBS,* W3ASK

TWENTY meters is expected to be the best band for DX propagation from sunrise to sunset during March, with 15 meters a close second during most of the daylight hours. Some 10 meter DX openings are also forecast during March, mainly to southern and tropical areas, during the daylight hours.

During the period between sunset and sunrise, 40 meters is expected to be the optimum band for DX propagation, with good openings forecast to many areas of the world. Some fairly good DX openings are also predicted for 80 meters during the hours of darkness, and some 160 meter DX openings may also be possible during this period. When propagation conditions are normal or better, the 20 meter band may also remain open to many areas of the world during the hours of darkness.

For specific times of DX openings for each amateur band 10 through 160 meters during March, refer to the DX Propagation Charts which appeared in last month's column. This month's column contains Short-Skip Propagation Charts for March and April, as well as Charts centered on Hawaii and Alaska. The Short-Skip Charts contain propagation forecasts for distances between approximately 50 and 2300 miles.

V.h.f. Ionospheric Openings

Some meteor scatter-type ionospheric openings are likely to occur on the v.h.f. bands during the second and third weeks of March, when minor meteor showers are forecast to take place.

Auroral activity generally increases during March. Some fairly good v.h.f. ionospheric openings usually occur during auroral displays. Such displays often take place during ionospheric storms. Check the "Last Minute Forecast" at the beginning of this column for the days forecast to be "below normal" or "disturbed" during March. Auroral-type v.h.f. openings are most likely to occur on these days.

Sunspot Cycle

The new sunspot cycle, which began during October, 1964, continues to increase at a very slow rate. The Zurich Solar Observatory reports a monthly sunspot number of 17 for December, 1965. This results in a smoothed sunspot number of 15.2 centered on June, 1965. A smoothed sunspot number of 29 is forecast for March, 1966.

*11307 Clara Street, Silver Spring, Md. 20902.

LAST MINUTE FORECAST

Day-to-Day Conditions and Quality for March

Days	Forecast Rating & Quality (4)	(3)	(2)	(1)
Above Normal: **4, 9, 13-14, 25, 31**	A	A-B	B-C	C
Normal: **3, 5-6, 8, 12, 15-16, 19-22, 24, 26, 30**	A-B	B-C	C-D	D-E
Below Normal: **1-2, 7, 10-11, 18, 23, 27, 29**	C	C-D	D	E
Disturbed: **17, 28**	D	D-E	E	E

How To Use These Charts

The following is an explanation of the symbols shown above, and instructions for the use of the *CQ* propagation predictions:

1—Enter Propagation Charts on following pages under appropriate band and distance or geographical area columns. Read predicted times of band openings at intersection of both columns.

2—Following each predicted time of band opening is a forecast rating which indicates the relative number of days the band is expected to open during each month of the forecast period. The higher the rating, the more frequent the opening, as follows: (4) band open more than 22 days each month; (3) between 14 and 22 days; (2) between 8 and 13 days; (1) less than 7 days.

On the "Short-Skip" Chart, where two numerals are shown within a single set of parenthesis, the first applies to the shorter distance for which the forecast is made, and the second to the greater distance. Note the forecast rating for later use.

3—With the forecast rating noted above, start with the numbers in parentheses at the top of the "Last Minute Forecast" appearing above. Read down the table for a day-to-day forecast of propagation conditions in terms of Above Normal (WWV rating higher than 6); Normal (WWV rating 5-6); Below Normal (WWV rating 4); Disturbed (WWV rating less than 4). The letter symbols (A-E) describe reception conditions (signal quality, noise and fading levels) expected for each day of the month and have the following meanings: A—excellent opening with strong, steady signals; B—good opening, moderately strong signals, little fading and noise; C—fair opening, signals fluctuating between moderately strong and weak; D—poor opening, signals generally weak with considerable fading and noise; E—poor opening, or none at all.

4—This month's Propagation Charts are based upon a transmitter power of 75 watts c.w.; 150 watts s.s.b., or 300 watts d.s.b., into a dipole antenna one quarter-wave above ground on 160, 80 and 40 meters and a half-wave above ground on 20, 15 and 10 meters. For each 10 db increase above these reference levels, reception quality shown in the "Last Minute Forecast" will improve by one level; for each 10 db loss, reception will become poorer by one level.

5—Local Standard Time for these predictions is based on the 24-hour system.

6—These Propagation Charts are valid through April 30, 1966. These Charts are prepared from basic propagation, data published monthly by the Central Radio Propagation Laboratory of the National Bureau of Standards, Boulder, Colorado.

DX Contest Post Mortem

The influence of rising sunspot activity was very noticeable during the 1965 *CQ* World Wide DX Contest. DX conditions during the 1965 Contest were observed to have been better than they were during the past four Contest periods.

The October PROPAGATION Column forecast "below normal" conditions for October 23, the first day of the Phone period, and "normal" for October 24, the second day of the period. Based on world-wide monitoring reports analyzed by the Central Radio Propagation Laboratory of

the National Bureau of Standards, October 23 began with "fair-to-good" conditions. By early afternoon conditions improved to "good", with one of the most extensive 10 meter openings reported in the past four years taking place. By evening, conditions returned to "fair-to-good". All-in-all, October 23 was an "above normal" day, and the forecast erred on the conservative side.

The 10 meter opening on October 23 was almost world-wide, and extended as far north as Switzerland, New England, and Japan. Several stations located in tropical areas reported working more than *50* different countries during the 10 meter opening. Excellent world-wide DX propagation conditions also existed on both 15 and 20 meters during the daylight hours. During the hours of darkness, good DX conditions existed to many areas of the world on both 40 and 75 meters.

Conditions on October 24 were, as forecast, "normal" throughout the day. Good DX propagation conditions were observed on 15, 20, 40 and 75 meters. The 10 meter band, however, did not open as extensively as it did on the previous day.

The November PROPAGATION Column forecast "normal" conditions for both days of the C.W. Contest Period, November 27 and 28. The forecast appears to have hit it pretty much on the nose. Conditions on both days were almost identical, varying between "fair", "fair-to-good" and "good". Both 15 and 20 meters opened to all areas of the world during the daylight hours, and both 40 and 80 meters provided good DX conditions to many areas of the world during the hours of darkness. Except for a few openings to some tropical and southern areas, propagation conditions on the 10 meter band were considerably below the level observed during the Phone period.

Conditions during the 1965 *CQ* World Wide DX Contest were better than they have been during the past four years. It is expected that either record breaking, or near record scores will result from the excellent propagation conditions that occurred during most of the Contest period.

73, George, W3ASK

CQ SHORT-SKIP PROPAGATION CHART

MARCH — APRIL, 1966

AT PATH MID-POINT
(24-HOUR TIME SYSTEM)

Band Openings Given In Local Standard Time

Band (Meters)	*50/250 Miles*	*250-750 Miles*	*750-1300 Miles*	*1300-2300 Miles*
10	*Nil*	*Nil*	08-20 (0-1)	08-15 (1-0) 15-18 (1) 18-20 (1-0)
15	*Nil*	09-16 (0-1)	09-13 (1) 13-16 (1-2) 16-18 (0-1)	08-09 (0-1) 09-10 (1) 10-13 (1-2) 13-14 (2) 14-16 (2-3) 16-18 (1-2) 18-20 (0-1)
20	*Nil*	07-12 (0-2) 12-16 (0-3) 16-18 (0-2) 18-23 (0-1)	06-07 (0-1) 07-08 (2) 08-10 (2-3) 10-12 (2-4) 12-16 (3-4) 16-18 (2-4) 18-19 (1-3) 19-21 (1-2) 21-23 (1)	06-07 (1-0) 07-08 (2-1) 08-10 (3-2) 10-15 (4-3) 15-18 (4) 18-19 (3-4) 19-21 (2-3) 21-23 (1-2) 23-01 (0-1)
40	06-07 (0-1) 07-08 (1-2) 08-10 (2-4) 10-17 (3-4) 17-19 (2-3) 19-21 (1-2) 21-23 (0-1)	06-07 (1-2) 07-08 (2) 08-15 (4-3) 15-17 (4) 17-19 (3-4) 19-21 (2-3) 21-23 (1-2) 23-06 (0-1)	06-08 (2) 08-15 (3-1) 15-17 (4-2) 17-19 (4-3) 19-21 (3-4) 21-23 (2-4) 23-02 (1-3) 02-06 (1-2)	06-08 (2-1) 08-15 (1-0) 15-16 (2-0) 16-17 (2-1) 17-19 (3-2) 19-21 (4-3) 21-02 (3-4) 02-05 (2-3) 05-06 (2)
80	07-08 (2-3) 08-10 (3-4) 10-18 (4) 18-20 (3-4) 20-22 (2-3) 22-01 (1-2) 01-05 (1) 05-07 (1-2)	07-08 (3-2) 08-10 (4-1) 10-16 (4-0) 16-18 (4-2) 18-20 (4-3) 20-22 (3-4) 22-01 (2-4) 01-05 (1-2) 05-07 (2)	07-08 (2-1) 08-10 (1-0) 10-16 (0) 16-18 (2-1) 18-20 (3-2) 20-01 (4) 01-05 (2-3) 05-07 (2)	07-08 (1-0) 08-16 (0) 16-18 (1-0) 18-20 (2-1) 20-22 (4-2) 22-01 (4-3) 01-05 (3) 05-07 (2-1)
160	05-07 (4-2) 07-09 (3-1) 09-17 (2-0) 17-19 (3-1) 19-20 (4-2) 20-05 (4)	05-06 (2-1) 06-07 (2-0) 07-09 (1-0) 09-17 (0) 17-19 (1-0) 19-20 (2) 20-22 (4-3) 22-03 (4) 03-05 (4-3)	05-06 (1) 06-19 (0) 19-20 (2-1) 20-22 (3-2) 22-03 (4-3) 03-05 (3-2)	05-06 (1-0) 06-19 (0) 19-20 (1-0) 20-22 (2) 22-03 (3-2) 03-05 (2-1)

HAWAII

Openings Given In Hawaiian Standard Time†

To:	*10/15 Meters*	*20 Meters*	*40 Meters*	*80/160 Meters*
Eastern USA	12-15 (1)‡ 06-08 (1) 08-12 (2) 12-15 (3) 15-16 (2) 16-17 (1)	02-05 (1) 05-07 (2) 07-13 (1) 13-15 (2) 15-17 (3) 17-18 (2) 18-20 (1)	18-19 (1) 19-21 (2) 21-00 (3) 00-02 (2) 02-03 (1)	19-21 (1) 21-00 (2) 00-02 (1) 22-00 (1)§
Central USA	11-16 (1)‡ 06-08 (1) 08-13 (2) 13-16 (3) 16-17 (2) 17-18 (1)	05-08 (2) 08-13 (1) 13-15 (2) 15-16 (3) 16-18 (4) 18-19 (3) 19-20 (2) 20-22 (1)	18-19 (1) 19-21 (2) 21-01 (3) 01-04 (2) 04-05 (1)	19-21 (1) 21-01 (3) 01-02 (2) 02-03 (1) 22-01 (1)§
Western USA	10-12 (1)‡ 12-14 (2)‡ 14-16 (1)‡ 07-08 (1) 08-09 (2) 09-11 (3) 11-15 (4) 15-17 (3) 17-18 (2) 18-19 (1)	04-06 (2) 06-11 (4) 11-15 (3) 15-17 (4) 17-19 (3) 19-21 (2) 21-00 (1)	17-19 (1) 19-20 (2) 20-23 (4) 23-05 (3) 05-06 (2) 06-07 (1)	19-20 (1) 20-21 (2) 21-04 (3) 04-05 (2) 05-06 (1) 20-22 (1)§ 22-02 (2)§ 02-04 (1)§

ALASKA

*Openings Given In GMT**

To:	*10/15 Meters*	*20 Meters*	*40 Meters*	*80/160 Meters*
Eastern USA	22-01 (1)	20-23 (1)‡ 00-02 (2) 02-04 (1)	06-13 (1)	07-12 (1)
Central USA	20-22 (1)‡ 20-22 (1) 22-00 (2) 00-02 (1)	23-01 (1) 01-03 (2) 03-04 (1)	07-14 (1)	07-12 (1)
Western USA	20-00 (1)‡ 20-22 (1) 22-00 (2) 00-03 (1)	19-22 (1) 22-00 (2) 00-02 (3) 02-04 (2) 04-06 (1)	06-08 (1) 08-12 (3) 12-15 (1)	08-10 (1) 10-12 (2) 12-14 (1) 10-12 (1)§

†Hawaiian Standard Time is 5 hours *behind* EST; 4 hours *behind* CST; 3 hours *behind* MST; 2 hours *behind* PST and 10 hours *behind* GMT.

*To convert to local times in Alaska, GMT or Z Time is 8 hours *ahead* of PST; 9 hours *ahead* of Yukon Standard Time; 10 hours *ahead* of Alaskan Standard Time and 11 hours *ahead* of Bering Standard Time.

‡Indicates possible 10 meter openings.

§Indicates possible 160 meter openings.

THE VHF COLUMN

BY BOB BROWN, K2ZSQ
AND ALLEN KATZ, K2UYH*

WOULD you like to participate in a computerized program that might predict propagation and QSO's on 220? K1VDZ and WA5GVF/1 have teamed up with a Honeywell 800 data processing system that's just waiting to hear from you.

The idea is simple: By feeding into the computer data submitted by 220 operators (using special reporting forms) on such stuff as power input of transmitter, noise figure of your converter and the distance covered in a typical two-way conversation, etc., the Groton, Connecticut crew hope to accumulate a vast amount of useful information for u.h.f. addicts.

Naturally the more who participate in this venture, the more reliable the results.

What do they expect the computer to tell us? Well, in cold hard numbers a formula solution should be derived which will tell truthfully how many miles to expect with a Brand X "13 db gain" antenna, the average coverage most 220 ops get now, and, as WA5GVF/1 explains it, "this will enable you to plug in a big range prediction graph and decide how far you can get out tonight."

In actuality the missing link to make the formula work is a 220 mc 'Figure of Merit.' By cooperating with the Connecticut team on a large scale, u.h.f.'ers can help obtain this number and put it into action.

"If, when you QSO on 220," states WA5GVF/1, "you report it to the two stations running the machine, they will, within six months we hope, publish some preliminary data, and later publish any iron-clad facts that have evolved from the study."

This programming effort should prove most interesting to all concerned. Dave Bray, K2LMG, conducted a similar study as published in the November 1961 *QST*, but his results were based on commercial reports and showed much poorer results as you go up in frequency. However, anyone who has played with low power on u.h.f. will tell you that you seem to get further with it.

Space doesn't permit a technical explanation of the process, nor the reproduction of forms, although we'd certainly run them if at all possible. By sending along a self-addressed-stamped-envelope, however, you'll get the full story.

The team emphasizes that they are ready to go right now. Send your s.a.s.e. immediately to: LT. JG. W. L. Kennedy, Jr., Box 18, Room 333, Sub Base, Groton, Connecticut 06342.

*c/ Allen Katz, K2UYH, 48 Cumberland Avenue, Verona, New Jersey, 07462.

Century Club Rules

The requirements for earning *CQ*'s VHF Century Club Certificates are actually quite simple:

1. Awards are issued to those holding the required number of QSL cards confirming contacts all made on a *single* v.h.f. band within *any* one 365 day period.

2. On 50 mc, 150 QSL cards are necessary; on 144 mc, 100 cards; on 220 mc, 13 cards; on 432 mc, 25 cards. See reference in column.

3. Separate entries must be made for each award; there is no limit to the number of certificates you can earn provided proper application is made for each.

4. Official application forms are available free of charge from *CQ*. Drop a card to: VHF Century Club, *CQ*, 14 Vanderventer Avenue, Port Washington, L.I., N.Y. 11050.

Certificates are individually numbered for classification purposes and are issued by band operated. All CCC's bear the cherished autograph of esteemed *CQ* editor, K2MGA.

Oscar IV Up—But Not In Synchronous Orbit

All seemed well Tuesday morning December 21 as news broadcasts reported the successful launch of the Atlas-Agenia rocket carrying Oscar IV. Our hopes were high for the communications revolution we knew would occur when an amateur repeater satellite, virtually fixed in space with 3 watts output and powered with solar cells, went into operation. But by

Present 432 mc station of WA4KFW, holder of the Florida end of the 420 mc non-moonbounce DX record—1150 miles running 2 watts out to a h.b. 11-element yagi. All gear is home-fashioned: exciter and tripler taken from *ARRL Handbook*, linear amplifier from the *VHF Handbook*, using 4CX250B—800 v. and about 80 watts out.

VHF DX RECORDS

The following represent the greatest confirmed distance records established by amateurs for two-way communications.

50 Mc

12,000 m.: LU3EX—JA6FR, March 24, 1956.

144 Mc

5250 m : OH1NL—W6DNG,* April 11, 1964.
Non-moonbounce, 2540 m.: W6NCZ—KH6UK, July 8, 1957.

220 Mc

2540 m.: W6NLZ—KH6UK, June 22, 1959.

420 Mc

5092 m : KH6UK—W1BU,* July 31, 1964.
Non-moonbounce, 1150 m.: WA4KFW—W5LOU, April 12, 1965.

1215 Mc

5092 m.: KH6UK—W1BU,* Aug. 9, 1962.

2300 Mc

170 m.: W1EHF/1—W2BVU/1, July 1963.

3300 Mc

190 m.: W6IFE/6—W6VIX/6, June 9, 1956.

5650 Mc

120 m.: WB6JZY—WA6KKK, Sept. 25, 1965.

10,000 Mc

265 m.: W7JIP/7—W7LHL/7, July 31, 1960.

Above 30,000 Mc

500 feet: W6NSV/6—K6YYF/6, July 17, 1957.

*moonbounce communications.

evening, it was quite obvious that this was not to be.

The third stage of the rocket had not fired, and there was a question as to whether Oscar IV was in orbit after all. The future of Oscar IV rested on amateur operating techniques, which have made apparent failures a success before. We listened intently during those early hours, but heard nothing.

The situation was different, however, in other parts of the country. In southern California, Bill, W6YQ, worked W4AWS in Florida using techniques very similar to those employed for meteor scatter propagation. Although Bill is a moonbounce enthusiast, we understand that he was using only a 32 element extended collinear and a Parks 432 mc transistor converter. Paul, W4HHK, also reports hearing Oscar IV during the beginning of the first orbit.

At this writing we know of at least four other QSO's through Oscar IV: DL9AR to DLØDB on orbit 2, K6HCP to W6GDO orbit 5, W6GDO to W5WXZ orbit 10, and WA2WEB to K2MWA/2 orbit 12. We have many reports from stations who have heard the beacon and/or themselves through Oscar IV, so there probably have been many other contacts throughout the satellite by now.

Present information indicates that Oscar IV is in a highly elliptical orbit varying from a high of 18,200 miles to a low of 106 miles. Because of its 106 mile perigee, it will probably not stay in orbit for more than a year. The beacon frequency is 431.925 mc and the repeater center frequency is 431.940 mc. Our own experience and the reports of other amateurs seem to indicate that a good 432 mc converter and a moderate size 432 mc antenna are all that is necessary to hear Oscar IV when it is in range. Although supposedly accurate tracking information is available, we suggest that best results will be obtained by continuously monitoring the beacon frequency. When the beacon is heard, start transmitting with high speed c.w. for short periods and use break-in operation.

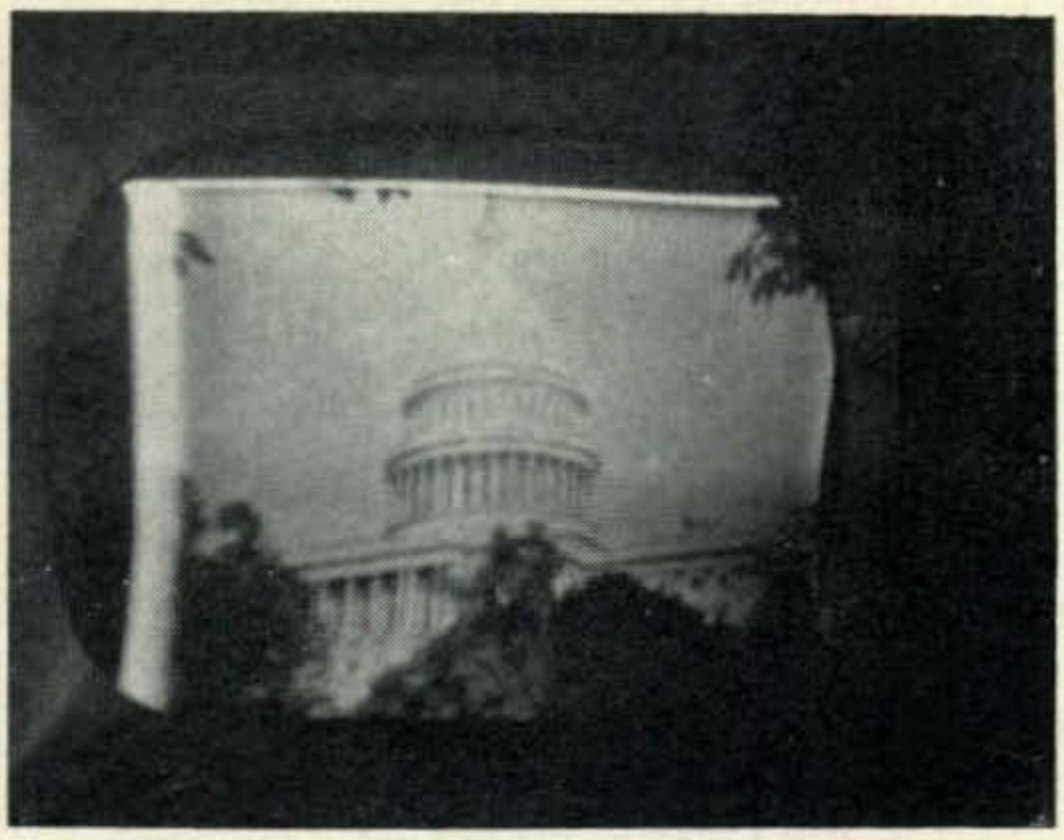
K6TSK finds that the use of two receivers is (one on the beacon frequency, the other in the repeater bandpass) extremely helpful. This procedure is necessary because the switch between the beacon and the repeater is not functioning properly.

Ken Holladay, K6HCP reports about 40 seconds of repeater operation out of every minute.

K2MWA/2 has been experimenting with f.s.k This group believes that once the repeater locks on a carrier, it will remain on as long as the carrier remains on. Thus, the use of a continuous carrier. At present we have no word on the success of this technique.

Before leaving the subject of Oscar IV we must mention that we have heard rumors that there will be another try to launch another Oscar satellite in synchronous orbit, possibly as early

WA4KFW's collinear array for 432 mc, barely visible above the TA-33. On 432, ½" nitrogen filled transmission line is employed instead of the conventional RG8/U.



If you were equipped for 432 TV monitoring and within K7VQI's capture area, this is what you might see. It's a slide of the nation's capital, one of many AI broadcasts regularly.

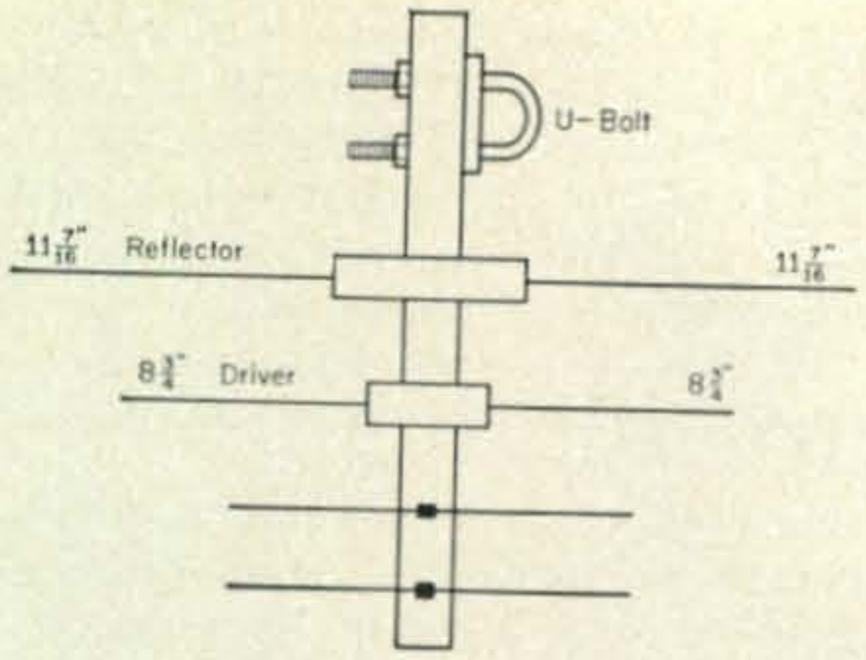


Fig. 1—Modification of the Cush Craft 24-element 432 mc array. This diagram shows what must be done on individual bays.

as February. We repeat, this is only a rumor, but if you don't have a 432 mc converter working and an antenna up, you had better. For if and when an amateur satellite goes into synchronous orbit . . . LOOK OUT!

432 Mc Antennas

There appears to be a lot of interest in a good commercial 432 mc antenna. Unfortunately, the commercial arrays available do not seem to have what it takes for 432. Yagis seem to fare the worst and collinears just don't seem to have the gain they should for their size. Rather than start from scratch, a good compromise is to modify a commercially available antenna for optimum performance.

Figure 1 shows a modification developed by K2TKN of the Cush Craft 24 element collinear yagi. The conversion involves only cutting off a few inches from the reflector and driven elements and the construction of your own phasing lines, so that the antennas can be spaced further apart. The antenna itself is mechanically well constructed and reasonably priced. We suggest that you try ordering the antenna without the phasing lines, since they are not needed in the modified version.

Twelve-Hour Contest

Just a reminder that the *CQ* 12-Hour V.H.F. Contest is scheduled for the first weekend in May. They'll be club aggregate listings, Novices awards—the works. For details, flip back to July *CQ* and plan now for this one. Time: 9 A.M. to 9 P.M., May 7.

Detroit Area UHF Bulletin

Recently received a dandy news bulletin that is jammed with facts, activity reports, w.b.f.m. groups, "rumors," where to get low-cost crystals. etc., that should be of considerable interest to the Midwest u.h.f.'er.

Published every couple of months, you can get yours by sending a stack of self-addressed stamped envelopes to George J. Poland, W8-FWF, 32219 Rosslyn St., Garden City, Michigan.

On 1296

Sparse reports of 1296 mc activity continue to come in, many as a result of an increase in solid-state devices. In Englewood, Florida, WA4BYR got on for the first time and established contact with K4NTD in Oakland on Nov. 28th. What's so unusual? Merely a distance of 121 miles a.m. to s.s.b.! A few minutes afterwards, WA4BYR QSO'd WA4GHK in Palm Bay (133 miles) for a solid c.w. chat. Average power for all stations, by the way, varies between 2 and 4 watts output.

Swinging to the Midwest we learn that K8TJP is presently working on a 1296 mc converter and should be on soon. Already active are K8AIY, W8UCT, W8RLT and W8JLQ.

On 432 & TV

K2PTS of Brooklyn, N.Y. will soon have a 10/10 "J" beam up. Present system consists of a Parks 432 mc converter into an HQ-180, 832 tripler coming out on 432.060. Steve reports QSO's with locals W2CCY, W2MDE, WA2SVG, W2DWJ and K2DZM.

Wide band f.m. seems to be making a strong comeback with over twenty stations in the Detroit area active on 432.9. Typical conversions are on Dumonts and Motorolas. W8BEZ is working now on a Link 450 mc receiver which should be completed by now.

On the ATV front, W6ORG reports that video in the L.A. area centers on 435 mc for modulated oscillators and 434.7 for crystal-controlled stations (8025 surplus rock.) f.m. audio is on 439.2 mc. A.m. audio and main cueing frequency is 147.8. Activity: Tuesday and Sunday, after 9 P.M.

Some more California notes: K6INQ is now running 600 watts on ATV, K6CHS, 900. Best DX with good pix, about 80 miles over hilly terrain between WB6LEN and WA6RGO, both running 100 watts.

The four-man team of W6EUZ, W6ORG, W6VCF and WA6RGO will be operating TV on Field Day this year. Should prove interesting!

[*Continued on page 104*]

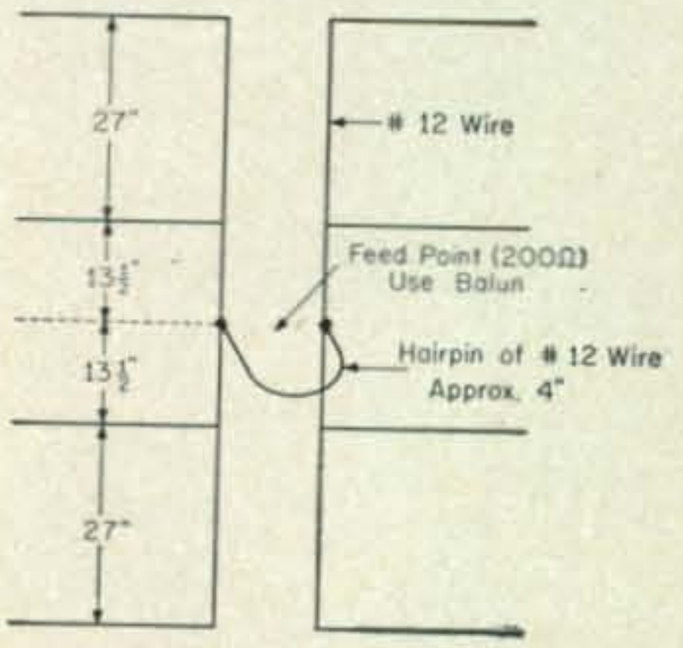


Fig. 2—Modification of the Cush Craft 24-element 432 mc array. Diagram shows construction and spacing of phasing lines. Hairpin should be adjusted for minimum s.w.r. At feedpoint (200 ohms), use standard horseshoe shaped balun (½ wave) to match to 50 ohm line.

SPACE COMMUNICATIONS

BY GEORGE JACOBS,* W3ASK

OSCAR IV, the latest radio amateur repeater satellite was launched from Cape Kennedy on December 21, 1965. Although not in its originally planned orbit, nor operating quite the way in which it was intended, numerous radio amateur signals have been successfully relayed through the satellite.

As of January 30, as this was being written, OSCAR IV continued to orbit the earth in a highly elliptical orbit approximately every 579 minutes. The satellite's orbit is inclined 26 degrees to the equator, and its point of apogee is 120 statute miles above the earth's surface, while its point of perigee is 20,600 miles high. OSCAR IV's period is decaying at the rate of approximately 7.5 seconds every revolution.

It was originally planned to place OSCAR IV in a near stationary orbit, out of reach of the Van Allen radiation belts. In its present elliptical orbit, however, the satellite passes through these zones of intense radiation several times a day. While it is not yet certain what effects the Van Allen radiation belts may have on the life of OSCAR IV, latest estimates are that the satellite should remain in orbit for at least another six months, and quite likely, somewhat longer.

Translator Operation

The translator aboard OSCAR IV is not functioning as planned. The electronic "switch" which was designed to turn the beacon transmitter on for 32 seconds every ten minutes appears to be inoperative. As a result, the beacon transmitter is operating almost continuously, and "captures" the translator. The resulting signal from OSCAR IV resembles a steady carrier at 431.928 mc, broken at regular intervals by incomplete HI identification signals, with a brief pause every minute or so, during which time it is possible to make use of the translator. The translator remains open for approximately 15 seconds or so, every minute.

The input passband to the translator remains at 144.095-144.105 mc, centered on 144.1 mc, in the amateur 2 meter band. The translator's output passband is approximately 431.933-431.943 mc, centered on 431.938 mc. OSCAR IV's beacon transmitter is operating on approximately 431.928 mc. The translator's output and beacon frequencies may appear to vary by several kilocycles because of Doppler shift. This is most noticeable when the satellite is near its point of perigee, and its speed with respect to earth is greatest.

*11307 Clara Street, Silver Spring, Md. 20902.

OSCAR IV Two-Ways

That OSCAR IV can relay signals despite its "run-away" beacon transmitter, can be seen by the fact that at least six c.w. QSOs have been confirmed through the satellite, as follows: W4AWS worked WKYK during orbit O; DL4AR worked DLØVB during orbit 4; W6GDO worked K6HCP during orbit 5; W6GDO worked K5WXZ during orbit 10; WA2WEB worked K2MWA/2 during orbit 12, and W6GDO worked W6FZA during orbit 15.

In addition, SM7OSC reports a contact with G3LTF on December 29, but the beacon transmitter captured the channel before reports could be exchanged in both directions.

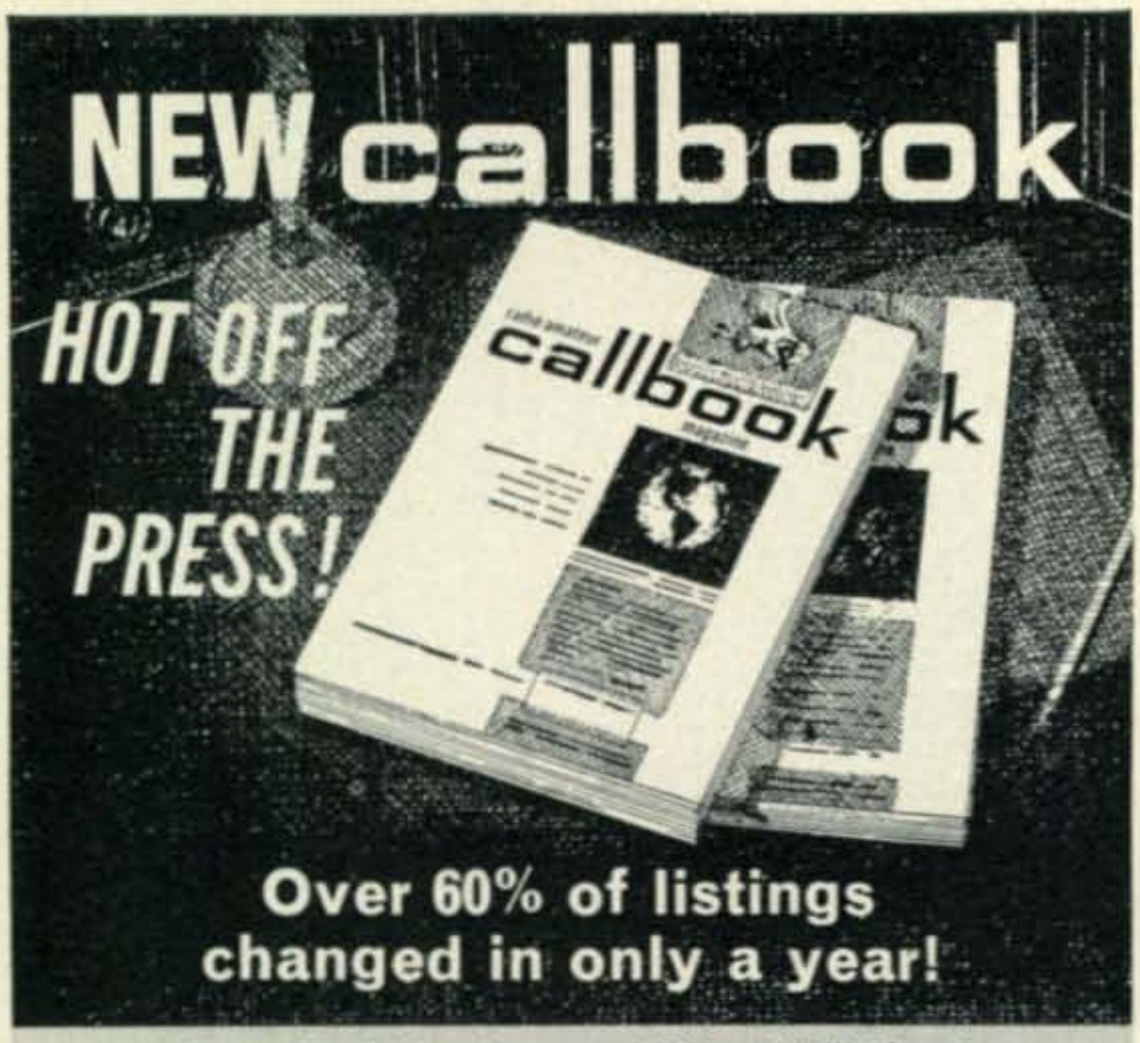
At least 70 different stations have already been reported to OSCAR Headquarters as having been heard through the satellite, as follows: K1LSY; K2GUG, K2MWA/2, K2VTW, WA2WEB; W4AWS, W4FJT, WA4FZK, W4GJO, W4IKC, W4WNH; K5CLU, W5AJG, W5HCJ, W5SAA, W5WXZ; K6HAA, K6HCP, K6RIL, K6TSK, W6FZA, W6GDO, W6GHV, WB6IOM, WB6KAP, W6NLZ, W6PUZ, W6QJW, W6TUZ, W6YK; K7DZG, K7GIR, K7ZER, K7WUU, W7LIT, W7UDM; W8YIO; K9AJJ, W9AAG, W9BRN, W9EGB or W9TGB, W9ZIH; KØIJN, KØRZI, KØRZJ, WØEYE, WØIC, WØLER; DJ1JN, DL3OV, DL3YBA, DL9AR, DLØVB; G3LQR, G3LTF; HB9RG; OK2WCG; OH2DV; SM6CSO, SM7OSC; VK1VP, VK2AAK, VK2RM, VK3AEE, VK3ALZ, VK3ATN, VK6HK, VK7LZ, VK7PF.

VK7PF heard the W6GDO-W6FZA QSO during orbit 15, as well as a number of other W calls. This may be the longest transmission (over 10,000 miles), recorded through any communications satellite, including SYNCOM and EARLY BIRD!

Several stations have reported that OSCAR IV's translator can be "re-captured" by using f.s.k. The steady carrier of the f.s.k. signal appears to re-capture the translator from the beacon signal, while the f.s.k. conveys the intelligence through the channel. K2GUG, K2MWA, and several other stations have reported hearing their own f.s.k. signals through the satellite for relatively long continuous periods, without interference from the beacon's signal.

It is urged that only c.w. be used for working through OSCAR IV, because of the satellite's narrow passband. Stations using voice are requested to avoid frequencies immediately adjacent to 144.1 mc, when the satellite is within range, in order to provide maximum opportunity for as many stations as possible to work through the satellite at the same time.

OSCAR Headquarters urges that reports of two-way QSOs through the satellite, as well as reports of stations heard be forwarded to Project OSCAR Headquarters, Foothill College, Los Altos Hills, California, as soon as possible. Wherever possible, signal strengths should be reported, as well as the level of interference being received from the beacon transmitter, if any. Stations using large antenna arrays are requested to include azimuth and elevation data taken as frequently as possible.



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Project Oscar Headquarters continues to provide data on Oscar IV's orbit. Listen to W6EE for Oscar bulletins Thursdays and Sundays on s.s.b. on 3935, 7235 and 14235 kc at 0400 GMT; on c.w. on 3507.5, 7015 and 14030 kc at 0415 GMT, and on RTTY on 3625, 7040 and 14090 kc at 0445 GMT. *Remember*, these times fall on Wednesday and Saturday evenings in the USA. Orbital information is also carried nightly by W1AW on its regular bulletin schedule.

Oscar IV is expected to remain in operation for at least another six months. There is still time to assemble the necessary equipment to communicate through the satellite. While it requires a great deal of patience and skill, it is an opportunity to participate in amateur radio history in the making.

Weather Satellites

Considerable interest has been shown by radio amateurs in the Automatic Picture Transmission system (APT) aboard the Tiros VIII and Nimbus 1 satellites. These slow scan television pictures of cloud formations are intended primarily for direct reception from the satellite using relatively simple and inexpensive receiving equipment. Wendell G. Anderson, K2RNF, in an excellent article entitled "Amateur Reception of Weather Satellite Picture Transmissions," describes equipment he uses for APT reception. The article appeared in the November, 1965 issue of *QST*. K2RNF's APT reception equipment cost less than $200 to assemble.

NASA plans to launch the second satellite in the Nimbus series during April, 1966. This satellite has been designed with a complete APT system capable of operating both day and night. The pictures will be transmitted to ground stations throughout the world on 136.950 mc.

To assist in assembling receiving equipment for APT reception, H. L. Schwartberg, W3VQQ, has made available to the ARRL ten identical tapes on which test signals and actual satellite-transmitted weather maps are magnetically recorded. The tape can be used for testing APT ground receiving equipment, such as that described in K2RNF's article.

Along with the tape there is supplementary information which describes the twelve complete frames recorded on each tape, and actual facsimile pictures made from the tapes for comparison with pictures that homemade reproducing equipment turns out.

Any good-quality tape recorder capable of handling a 10 kc audio band and operating at 7.5 i.p.s. can be used with the tape recording. Radio amateurs planning to assemble equipment for reception of APT signals can borrow a copy of the tape from the Technical Editor, *QST*, 225 Main Street, Newington, Conn. 06111.

More complete information concerning the Automatic Picture Transmission System can be obtained upon request from Dr. Morris Tepper, Director of Meteorological Programs, Office of Space Science and Applications, NASA, Washington, D.C. 20546. 73, George W3ASK

NOVICE

WALTER G. BURDINE,* W8ZCV

IT is strange to say that I never get any letters about antennas except asking about antennas that can be installed in locations where the landlord will not permit ham operation, in restricted spaces and inconspiciously.

There has been many thousands of words written about restricted space antennas and their operation. Lots of DX has been worked with such antennas. I have often wondered why the restricted space ham doesn't use mobile antennas. I know they have to have loading coils and special tuning set-ups but they do work. How about using two meters or higher frequency bands? How do you know they won't work. A two meter beam could be built small enough to operate from a camera tripod with the pan head serving as a rotator mounting, manually operated. Ah, Ha, you are thinking now, a ham station could be built in a very small space for the ham in a housing development or apartment where antennas on the roof are forbidden. Surely, it doesn't work as well as a 16 element beam but it *does* work and it *is* simple. See my antenna for two meters in the December, 1962 NOVICE column for a good job for the portable two meter antenna. A new simple antenna for both 220 mc and 432 mc operation is in the works, watch for it.

Restrictions

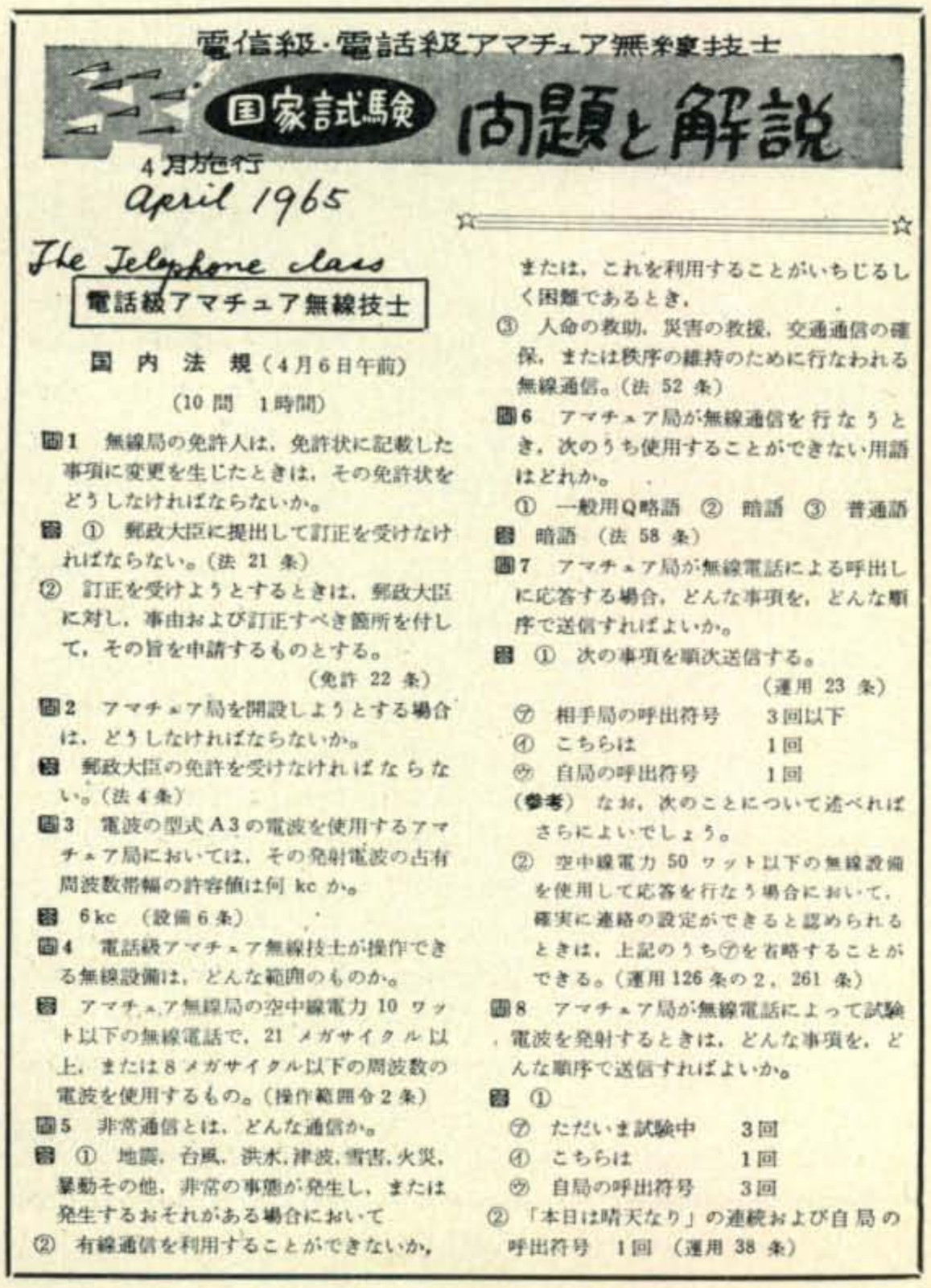
As Novices are we allowed to work any country that we hear? What is reciprocal licensing? These questions have been asked by many of our readers. Many of the Novices are taking advantage of the fifteen meter band and working plenty of DX. Many have worked all continents (WAC), all states (WAS) and a few have worked DXCC. The reports of listeners in other countries shows that our Novices are working out quite well with their 75 watts and good antennas.

Novices and all other classes of licensees are not allowed to communicate with countries that have forbidden communications between their amateurs and amateurs of the United States. The governments of these countries have not signed the agreements between countries that permit communications between their amateurs and the amateurs in our country. Other reasons for forbidding communications may be used by the two governments. Article 41 of the 1959 Geneva Conference of The International Telecommunications Union makes provisions for amateurs of any two countries to conduct two way communications on the amateur bands if the two governments have signed the agreement. Amateurs of the United States of America are not allowed to communicate, by radio, with amateurs of Cambodia, Indonesia, West New Guinea, Thailand and Viet Nam. DON'T WORK . . . 8F, 3W8, XU and HS. I might add; a new country in your log book is not worth the possible loss of your license.

Reciprocal Licensing

Reciprocal licensing permits the licensed amateur of one country to operate or be licensed in another country merely by making the proper application and showing proof of license on a reciprocal arrangement. Usually the amateur from another country may operate only to the extent of his license in the country he is visiting. Don't forget many countries do not have licenses corresponding to our Novice and Technician class. Operation is generally done under the rules of the class of license in the country you are visiting.

The United States has signed reciprocal agreements with Australia, Belgium, Bolivia, Canada, Costa Rica, Dominican Republic, Ecuador, Luxumbourg, Peru, Portugal and Sierra Leone. We are at present negotiating with several other countries to sign reciprocal licensing agreements. Many countries permit our amateurs to operate amateur stations while in their countries as a courtesy, we may not now offer the same cour-



電信級・電話級アマチュア無線技士

国家試験 問題と解説

4月施行

April 1965

The Telephone class

電話級アマチュア無線技士

国 内 法 規（4月6日午前）

（10 問　1時間）

問1　無線局の免許人は，免許状に記載した事項に変更を生じたときは，その免許状をどうしなければならないか。

答　① 郵政大臣に提出して訂正を受けなければならない。（法 21 条）

② 訂正を受けようとするときは，郵政大臣に対し，事由および訂正すべき箇所を付して，その旨を申請するものとする。（免許 22 条）

問2　アマチュア局を開設しようとする場合は，どうしなければならないか。

答　郵政大臣の免許を受けなければならない。（法 4 条）

問3　電波の型式 A3 の電波を使用するアマチュア局においては，その発射電波の占有周波数帯幅の許容値は何 kc か。

答　6 kc　（設備 6 条）

問4　電話級アマチュア無線技士が操作できる無線設備は，どんな範囲のものか。

答　アマチュア無線局の空中線電力 10 ワット以下の無線電話で，21 メガサイクル以上，または 8 メガサイクル以下の周波数の電波を使用するもの。（操作範囲令 2 条）

問5　非常通信とは，どんな通信か。

答　① 地震，台風，洪水，津波，雪害，火災，暴動その他，非常の事態が発生し，または発生するおそれがある場合において

② 有線通信を利用することができないか，または，これを利用することがいちじるしく困難であるとき，

③ 人命の救助，災害の救援，交通通信の確保，または秩序の維持のために行なわれる無線通信。（法 52 条）

問6　アマチュア局が無線通信を行なうとき，次のうち使用することができない用語はどれか。

① 一般用Q略語　② 暗語　③ 普通語

答　暗語　（法 58 条）

問7　アマチュア局が無線電話による呼出しに応答する場合，どんな事項を，どんな順序で送信すればよいか。

答　① 次の事項を順次送信する。（運用 23 条）

㋐ 相手局の呼出符号	3回以下
㋑ こちらは	1回
㋒ 自局の呼出符号	1回

（参考）　なお，次のことについて述べればさらによいでしょう。

② 空中線電力 50 ワット以下の無線設備を使用して応答を行なう場合において，確実に連絡の設定ができると認められるときは，上記のうち㋐を省略することができる。（運用 126 条の 2，261 条）

問8　アマチュア局が無線電話によって試験電波を発射するときは，どんな事項を，どんな順序で送信すればよいか。

答　①

㋐ ただいま試験中	3回
㋑ こちらは	1回
㋒ 自局の呼出符号	3回

② 「本日は晴天なり」の連続および自局の呼出符号　1回　（運用 38 条）

Japanese license guide.

*R.F.D. 3, Waynesville, Ohio 45068.

tesy. This courtesy may offer a safe bridge to international peace.

We all owe Barry Goldwater, K7UGA a big debt of gratitude for the work he and his fellow members of Congress did to bring about reciprocal licensing privileges, tell him so when you talk to him on the air.

Another subject along these same lines, but one on which I have never had a question, is the subject of third-party traffic. Third-party traffic is any message addressed to an amateur in another country other than the amateur himself. These messages may be handled by U. S. amateurs on behalf of third parties only with amateurs in countries with the following prefixes: CE, CM, CO, CP, EL, HC, HH, HP, HI, HK, HR, OA, PY, TI, VE, VO, XE, YN, YS, YV, ZP, and 4X. Add XP (Greenland) to this list. All third party messages must not be important enough to justify using regular commercial communications facilities. Check your national radio club or society bulletin for the regulations in YOUR country.

Amateur Radio In Japan

As stated in the February column, the following is a description of amateur radio licensing procedures in Japan. The information along with the picture of their license manual was supplied by Hijmae Suzuki.

The Japanese Radio society is the JARL with about 16,100 members, 13,200 of whom are licensed. The membership in the JARL costs $2.50 per year. The costs of the operators license is $1.10 and the license fee is 60 cents per year or $3.00 for the five year license term. There is no age limit but the licensee must be a citizen. The power limit is a maximum of 500 watts.

The amateur radio examinations are given only twice a year, in April and October. The examining and licensing authority is the Ministry of Posts and Telecommunications. There is about 38,000 amateurs in Japan. They have four classes of licenses in Japan. There is no age limit for those taking the tests and becoming amateurs. The person taking a test may use a his bug or speed key if he furnished it at the exam. Otherwise, he will use a straight key and is not allowed to use automatic electronic keyer. The bands and power levels are shown in the following table. After WW II the Japanese amateurs were assigned spot frequencies in the present amateur bands with two classes of licenses, first and second class. This was in 1952, later they were assigned "band operation". In 1958 the licensing structure was changed to allow four classes of licenses, the telegraphy and telephone class. The second class license was given "all band" privileges. Before this change the license was for 3.5 and 7.0 mc and above 50.0 mc with 10 watts output. New Rules and Regulations were adopted in 1965 to change the licensing structure and method of giving the tests.

License Classes and Privileges

First Class: 10 w.p.m. in the Japanese code, 12 w.p.m. International code, three minutes each. Laws and Regulations, 5 questions essay type about 2 hours. Wireless Engineering: 5 questions essay type about 2½ hours.

[*Continued on page 94*]

Frequencies	Modes	Powers and Classes of license
1,880 kc	A1	200 watts First class only.
3.5 to 3.575	A1, A3, A3a A3h, A3j	10 watts all classes. 100 watts Second class. 500 watts First class.
7.0 to 7.1 mc	Same as above	10 watts all classes. 100 watts Second Class. 500 watts First Class.
14.0 to 14.35	Same as above	Same as above.
21.0 to 21.45	Same as above	Same as above.
28.0 to 29.7 50.0 to 54.0 144 to 146 mc	A1, A2, A3, A4, A3a, A3h, A3j, F1, F2, F3 and F4.	50 watts. If necessary 100 watts or 500 watts permitted for the second or first class.
430 to 440 mc	F1, F2, F3, A3, A5, A3c and A9.	10 watts Telephone or Telegraph Class. 50 watts First and Second Class. 10 watts Telephone and Telegraph Class.
1,215-1,300 2,300-2,450 5,650-5,850 10 to 10.5 gc 21 to 22 gc	A1, A2, A3, A4, A5, F1, F2, F3, F4, F5, PO, P1, P2d, P2e, P2f, P3d, P3e, P3f and P9	1 watt. If necessary, 10 watts for Telegraph and Telephone Class, 100 watts Second Class 500 watts for First Class license.

Table I. Frequency and power privilege for Japanese licensees.

RTTY

BYRON H. KRETZMAN,* W2JTP

RTTY Operating Frequencies

Nets centered on frequencies given; operation usually ± 10 kc on h.f.

80 meters	3620 kc
40 meters	7040 kc
40 meters (narrow shift)	7140 kc
20 meters	14,090 kc
15 meters	21,090 kc
6 meters	52.60 mc
2 meters	146.70 mc

SHORT subjects, might be the title of this month's Column on radioteletype. Or maybe, RTTY Clinic, to borrow a word from Chuck, W6QLV, Editor of the HAM CLINIC Column. Since RTTY is a relatively "new facet" of amateur radio, to quote a friend in Newington, Connecticut, it is only natural that so many newcomers and potential RTTYers would have questions. Unfortunately, due to the press of personal business last year, we had limited time for ham radio so we must admit a few letters went unanswered. Chuck's system looks like a good way to catch up.

On Operation

Many letters, and off-the-air copy, indicates that a goodly number of fellows are not quite sure about signing their call. Some just don't bother signing on RTTY, signing only on c.w. Others do a lot of unnecessary signing, and frequently add the useless phrase, "STAND BY FOR CW ID." And, many chop off the carrier for c.w. ident, leaving the carriage jumping up and down in the middle of a page. So, let us run down the procedures that were established more than a decade ago, procedures that are based upon standardization, ease of operation, and consideration for the fellow on the other end. And, of course, accordance with FCC Rules.

First of all, you *must* sign on RTTY with *both* your call and the call of the station you are working. You also must sign your call in Morse (or 'phone if on v.h.f.). You *don't* have to sign more than once every ten minutes during a QSO, nor do you have to use c.w. for the mandatory Morse. You can use f.s.k. as well as c.w. for this purpose, providing that such signature can be easily copied by a monitoring station. (No "wise-guy" signing at 50 w.p.m. and/or with ⅔-cycle shift.) It is much more considerate of the fellow on the receiving end if you use narrow shift, say 100-cycles, for this purpose. This allows his TU to rest on *mark*, giving him plenty of time to lock-out or shut off the motor before you cut your carrier.

Keyboard procedure is simple. To call a station the "3 × 3" is recommended. That is, type the call of the other station 3 times, DE, then your call 3 times, followed by a K, two CAR RET, one LINE FEED, and two LTRS. Then send your call, only, on Morse, preceeded by a DE and followed by a K. (Those with a little imagination and ingenuity can figure out a way to sign the Morse automatically.) In QSO it is only required to sign once every ten minutes. When you do, type the call of the other station once, DE, then your call, followed by a K, two CAR RET, one LINE FEED, and two LTRS. Then send your call on Morse with the customary DE and with a K. The object here is to put the *other* fellow's machine back at the beginning of a clear line. Sending the CAR RET and LTRS characters twice provides a little extra margin in the presence of QRN and QRM.

When you go back to a fellow, don't start sending (this is particularly applicable to tape transmission) the split-second you throw on the carrier. Put on the carrier, then wait about 3 to 5 seconds (resting on *mark*) before you hit the keyboard or TD switch. The object here again is consideration for the other fellow. (He may be using an "attended" autostart motor control or lock-out that requires a steady *mark* signal for a few seconds before printing can begin.) The AN/FGC-1 monitor circuit is one example. After all, fellows, how long is a few seconds?

Operating procedure on v.h.f. where a.f.s.k. is used is little different from that described above. One minor difference is that the dual identification requirement can be met by giving your call on 'phone instead of with Morse. General practice, though, probably because it is standard on the h.f. bands, is to use Morse. A major difference, in some areas of operation where old autostart TU's are still in use, is to finish a transmission with a steady *space* signal of about 3 to 5 seconds, then cutting the carrier. This is because these older autostart circuits require such a *space* signal to shut off the motor. Speaking of autostart, general practice with unattended monitoring is to monitor the first 1½ to 2 minutes following the hour, of certain hours, as programmed by a clock mechanism. Unattended monitoring also usually is set up to require one *minute* of a steady *mark* to start operation. (This is to insure against false starts due to attended operation on the channel not directed to this particular machine.)

On h.f., as well as on v.h.f., three bells are frequently sent just before turning it over to the other fellow. (Very few of us keep our eyes on the machine every second as it prints.) This is used many times in net operation, too, assign-

*431 Woodbury Road, Huntington, N. Y. 11743.

ing different numbers of bells to each station. Some especially ingenious RTTYers even use the bell signal to automatically switch from receive to transmit in a fast bell-break-in QSO.

Questions

Machine Availability—"Where can I get a Teletype machine?"

Check the June 1965 RTTY Column; we gave a brief description of the various machines and many possible sources. Also we listed a couple of people who service amateur machines.

Kleinschmidt Machines—"Can you tell me who I might contact in my search for parts for the Kleinschmidt TT-4A Teleprinter? I have tried a few names appearing in your past columns without success. WA6SWA."

This is why we suggest to RTTYers that they stay with Teletype Corporation machines; Kleinschmidt machine parts are *not* easy to obtain. Suggest you contact Ben Woodruf W9UE (6140 North Harding Ave., Chicago 45, Illinois) who may be able to steer you.

50 kc i.f. Converter—"What is the story on the RTD-1 50 kc discriminator assembly that is the heart of the i.f. TU described on page 77 of the *New RTTY Handbook?*"

This is the sad story: Originally this was made by D & R Ltd., on the west coast. They went out of business. Next, the Ortho Filter Corporation in Paterson, New Jersey, agreed to supply this at a reasonable price. Later, Ortho was apparently taken over by the New York Transformer Company of Alpha, New Jersey. When W4UHA wrote to Ortho, he got a quote from N.Y. Transformer of $95.00, each! Next, we learned from K3HOL that he had a quote from a "Louis Mirenna" of N.Y. Transformer of $18.00 each, but with "no literature, specifications, application sheets, pictures, mounting dimensions, warranty or guarantee." (!) If there is still enough interest in this assembly, we will try to find someone else to make it. Drop me a post card if *you* are interested.

Test RTTY Signals—"Where can I find a good commercial test signal to check out my machine and TU? I have a receiver which covers ham bands only, with a little overlap."

Well, this is tough because most commercial or government stations near our band edges use shifts and speeds different from what we normally use. The exception is the U.S. Weather Bureau station on 14,395 kc in Miami which transmits Caribbean area aeronautical weather information using 850-cycle shift and 60-speed. The catch is that they transmit to machines with weather symbols and use the Synoptic Weather Code. (Also, without unshift-on-space.) So, even with these limitations it is a good test signal. Another good test signal is on about 2,010 kc with CIH as call letters. The signal is strong on the east coast, but because of the low frequency it is subject to multipath problems, so you can expect errors. (Traffic is mostly the quick brown fox.)

K9QNV, Grayslake, Lake County, Illinois RTTY station of John D. Foss, with Model 15 machine in the foreground.

Tuning Fork Standard—"Looking on page 176 of the *New RTTY Handbook* I cannot match the printed circuit board to the schematic. K2GWY."

Well, Al, look in the RTTY Column for October 1962 and you will find full-size layouts of the printed circuit board and of the component placement. Also shown is an end-view of the coil and magnet assembly which should clear up any misunderstanding.

On the Bauds

K1AFC of Newington, Conn., is looking for an AN/FGC-1. K2YHK is /1 in Provincetown (Cape Cod), Mass., and is on 80. Oldtimer RTTYer W1EFF of Gray, Maine, is also on 80.

WA2CUB of Woodbury, N.J., uses tape on 80. WA2NWW of Huntington, L.I., chases DX on 20. W2VMN of Holland Patent, N.Y., is on 80. W2FTX of Millville, N.J., uses a Drake TR-3 and W2JAV transistorized TU on 80. W2QRF of New Rochelle, N.Y., is an OBS sending RTTY on Monday, Wednesday, and Friday at 2100 EST and 1000 EST Saturday and Sunday. K2DCY of New York City has a MITE teleprinter so now he wants to sell his Model 32ASR for $515. K3OJX of King-of-Prussia, Pa., uses his Model 15 and FRXD with one-half of an AN/FGC-1, a Valiant I, and an R-270/FRR receiver, mostly on 80 meters. W3YPI of Millersville, Pa., is also on 80.

W4AOI of Conicville, Va., uses tape on 80,. W4AWY of Charleston, S.C., sends ARRL Bulletins Sunday mornings on 20 meters. K4EID/6 is in Marina, Calif., and would like to go solid state but can's find any W2JAV printed circuit boards. WA4KYR of Bristol, Tenn., is trying to get a Swan 350 working on RTTY with his Model 19. He has it receiving but hasn't yet found a way to make it f.s.k. W5FCP of Dallas, Texas, works 20 with tape. K5BXB of Houston, Texas, obtained his Model 15 and 19 machines through the South Texas RTTY Society, Box 13452, Houston, Texas 77019.

W7BIF (WA6VSJ) is looking for a TM for

[*Continued on page 98*]

YL

LOUISA B. SANDO,* W5RZJ

CONGRATULATIONS to the winners of YLRL's 26th Anniversary Party! The c.w. section (Oct. 20-21) was won by VE3BII, Jeanine, for the second straight year, while K6KCI, Irma, earned the top score in the phone section (Nov. 3-4), also for the second straight year in a row. The Corcoran plaque, given by W8TPZ for highest *combined* score, was won by K5YIB, Barbie. W4HLF, Arlie, will announce the winners of her cups for DX YLs.

Here are the top scores:

1st c.w.—VE3BII, Jeanine Burgess 1959
2nd c.w.—W9MLE, Lanola Putnam 1417
3rd c.w.—K5YIB, Barbara Houston 1290
1st phone—K6KCI, Irma Weber 10057
2nd phone—K4RNS, Marge Campbell ... 9660
3rd phone—K5YIB, Barbara Houston 9142
1st combined score—K5YIB,
Barbara Houston 10432
2nd combined score—WB6CGA,
Evelyn Kinder 6348
3rd combined score—VE3BII
Jeanine Burgess 6160

WØHJL, Kayla, who checked all the logs, adds that it was necessary to disqualify several which were postmarked long after the deadline, or which were not signed, or showed no claimed score. She suggests you gals read the rules more carefully before the next contest.

District & Country Leaders

Phone		C.W.	
K1IIF	4300	K1UOR	1110
K2KCQ	2550	K2UKQ	1235
WA3ATQ	3468	WA3AZU	130
K4RNS	9660	K5YIB	1290
K5YIB	9142	WA6AOE	800
K6KCI	10,057	K7ADI	150
K7WVT	5966	W8WUT	651
K8RZI	7236	W9MLE	1417
K9LUI	5460	WAØEXX	352
KØEPE	3870	VE3BII	1957
VE3BII	4202	VE3DZ	517
VE6ABP	3000	VE6ABV	858
VE7NW	4692	JA1YL	392
KL7FMI	1925	PY2SO	940
KP4CL	4465	VK3KS	15
KZ5TT	1080	ZL2JO	30
DJ2YL	972		
JA1YL	4262	**Combined, DX Only**	
PY2SO	3774	JA1YL	4664
VK3KS	157	PY2SO	4714
XE1HHH	3219	VE3BII	6160
ZL2JO	925	VK3KS	172
		ZL2JO	995

*4417 Eleventh St., N.W., Albuquerque, New Mexico 87107.

Nan Garrison, WA8-BND, received the James W. Faulkner Scholarship in Journalism at Ohio State Univ. where she is a senior.

WA8BND Earns Scholarship

Congrats to WA8BND, Nan, for receiving the James W. Faulkner Scholarship in Journalism at Ohio State Univ. Nan is a senior, and this last summer worked on a public relations internship at Grant Hospital in Columbus. She has had her ham ticket since July '62. Her dad was a ham from high school till WW II. When she was a senior in high school Nan thought hamming would be fun, so her Dad put together a station, got his General and his old call, W8FGD, and Nan got her Novice. Nan adds, "Mom swore she wouldn't have anything to do with the crazy stuff, so it wasn't long until she had her license, too, in June '63, with call WA8FSX."

The Garrisons operate 75, 80 and 40, and can go on 20, 15 and 10. They used to be "CW Forever People," until WA8FQW talked them into sideband and they got a TR3.

Nan and her Mom, Ruth, W8FSX, are both Buckeye Belles (Ruth secretary in '65). They are members of YLRL, ARRL, RCC and Columbus ARA, for which Ruth also has been secretary. Besides ragchewing they keep frequent skeds with W8FDG's sister, Nell, WA8DWL, and nephew, WA8BUW, at Celina.

Comments from an OM

"After reading your column in June *CQ* about WB6DNW, and doing some thinking about past ham activities, I want to salute all the ladies who are on the air. I am firmly convinced from my own experience that if you want to get traffic passed, give it to the gals. Routine or priority, dedication will get it through. . . . Enclosed is

WA5EKN, Joy, at mike; WA5EMP, Tom, at printer.

Officers of The Ontario Trilliums, first YL club in Canada. L. to r., front row: VE3EUV, Doree, chm. of nominating committee; VE3ASZ, Betty; VE3EZI, Ivy, secretary; VE3FRN, P/C and Editor. Back row: VE3DGG, Jean, v. pres.; VE3CLP, Marion, certificate custodian; VE3FUR, Doreen, social chm.; VE3BII, Jeanine, president; VE3BBO, Doris, treasurer.

a shot of my XYL, Joy Middleton, WA5EKN/4, W. Hollywood, Fla., and myself. She can be found on all bands and modes including RTTY. We had high hopes of being able to QSO between W4 land and Athens, Greece, but leave it to an OM to goof. Two days after checking into my squadron I had a heart attack, so while recuperating thought I'd send some QRM your way. By the way, Joy's net activities are primarily with AF MARS."—WA5EMP/SV, Tom. Tnx, Tom; hope you are all recovered by now!

Silent Key

Sincere condolences to Anita Bien, W4JCR, ex-W8TAY, whose OM became a Silent Key on Dec. 26, 1965. Frank's call was W4JCS, ex-W8SSV, and the Biens had lived at Cleveland, Ohio and Asheville, N.C. before moving to Gainesville, Fla.

YLRL

Receiving Treasurer for YLRL for 1966 is Toni Chapman, K8PXX. Your YLRL dues should be sent to her at West 2nd St., Plain City, Ohio.

15th Midwest YL Convention

W9LDK reports plans are developing rapidly for the 15th Annual Midwest YL Convention, to be held May 13-15 in Chicago. Adeline adds that the LARK's Fall Festival was most successful and the club accumulated a nest egg to obtain prizes for the Saturday luncheon, one of the highlights of these conventions. The Flying Carpet Motor Inn, location of the convention, is not only most attractive and with all facilities, but it is especially convenient being adjacent to O'Hare Airport and only a mile from the Illinois Tollway and Expressways.

Here and There

The 11th birthday party for members of TYLRUN was held in Ft. Worth Nov. 12-13 with WHO club as hostess. Following are officers for 1966 for TYLRUN: Pres., K5YFC, Helen; V.P., W5COT, Pearl; sec.-treas., K5JFJ, Julie; P/C, K5TZU, Irma; Grapevine Editor, K5UKK, Cory.

GAYLARK officers for 1966 are: Pres., K5JKV, Annie; V.P., W5CXM, Phyllis; sec.-treas., K5BJU, Harriett; historian, WN5MPM, Francis.

YL-OM Contest

Just a reminder of the YL-OM Contest: **Phone** Feb. 19-20; **c.w.**—Mar. 5-6, 1966. Check January *CQ* for full rules.

33, Louisa, W5RZJ

Novice [*from page 90*]

Second Class: 9 w.p.m. International code, sending and receiving, two minutes. Laws and Regulations, 5 questions essay type about two hours. Wireless engineering 10 questions, about 2 hours.

Telegraph Class: 5 w.p.m. International code about 1 minute sending and receiving. Inland laws and regulations, 10 essay type questions about 1 hour. Wireless Engineering, 10 questions, about 1 hour.

Telephone Class: Inland Laws and Regulations, 10 questions, about 1 hour. Wireless Engineering, 10 questions essay type about 1 hour.

Code shall be common words with no cyphers. Code can be sent with straight key but you may use your bug type key if you provide same, no electronic keyers.

Sorry for the short column this month, we'll try to make up for it next month.

Don't forget the Dayton Hamvention on April 16, 1966. Check the ANNOUNCEMENTS column and if you can, try and make it.

73, Walt, W8ZCV

Club Forum [*from page 20*]

W2KPQ; Vice President, Mike, WA2BVU; Secretary, Dolph, K2PKH; and Treasurer, Ernie, WB2FNT.

For further information on LIMARC contact the Secretary Dolph Gobel, 8 Willow Pl., Great Neck, New York 11021. Among the aims of this club are to place emphasis on increasing their technical ability to surmount the various problems associated with mobile operation and to increase participation in the public service aspect of our avocation.

A club publication is in the works and will be known as *The LIMARC Log*. It will be edited by Ernie Juhn, WB2FNT. Ernie would be happy to set up a swap deal with editors of other mobile club publications. Send your publication to Ernie at: 109-01 72nd Rd , Forest Hills, N. Y. 11375.

Till next month remember that the club amateur is truly a leader in amateur radio affairs and is often looked up to by the non-joiners. Let's remember that as leaders we should set an example by observing all FCC rules and good operating practices.

73, Al, WA2TAQ

Surplus Sidelights

BY GORDON ELIOT WHITE*

SINCE I fell into writing this column via several articles on the Command Sets (the prime surplus bargain of them all) I have received a good deal of mail asking information on other units. Without doubt, the largest number of inquiries have concerned the AN/ARR-2 receiver, a real puzzler.

The AN/ARR-2 was mentioned in my October, 1965 *CQ* story on accessory gear to the AN/ARC-5 equipment, and has been touched upon before in this magazine, but nowhere, I believe, has it been described completely and clearly.

The ARR-2 was the last step in the development of a Navy navigation system which included the ZB-1, ZB-2, and AN/ARR-1. All of these receivers were designed to pick up v.h.f. signals—usually 246 mc—and provide azimuth information to carrier planes on their way back to the ship.

The shipboard transmitter put out a keyed signal to a highly directional yagi beam antenna which was rotated in synchronism with the keying so that, for example, when the beam was pointed north the signal "A" might be heard, "B" in the next 15 degree segment, "C" in the next, and so on around to north again. (Generally the coding was more complex)

In order to keep the system "secure" from enemy ears, the carrier frequency chosen was higher than direction finding equipment of that day could pick up, particularly since the enemy fleet was generally over the horizon and aircraft of WW II did not carry sophisticated ferret gear.

To make interception even more difficult, the keyed tone modulation was supersonic, generally in the vicinity of 1,000 kc. An ordinary v.h.f. receiver would reveal only the heterodyne from the carrier frequency. In the ZB receiver the incoming 246 mc signal was amplified in a series of tuned r.f. amplifiers, and the 1,000 kc modulation fed to a command-type receiver covering 520-1,500 kc, in which the signal was received as an ordinary 1,000 kc r.f. carrier.

The ZB and AN/ARR-1 sets are tuned-radio-frequency amplifiers with detectors and r.f. output provisions, to be used with ARA or AN/ARC-5 receivers covering the broadcast band. In fact, the 520-1,500 kc command receivers including the Army BC-946 were procured solely for this purpose.

The ZBX and AN/ARR-2 contained similar t.r.f. front ends and detectors, plus six r.f. and oscillator channels which could be selected to heterodyne the supersonic modulation into a 200 kc i.f. and finally to an audio signal, eliminating use of the accessory Command receiver. These sets are not superhets for the incoming v.h.f. signal, the local oscillator being used to beat the 1,000 kc modulation into the 200 kc i.f. Unmodified therefore, they are of no use in reception of ordinary a.m. or c.w. signals.

As described by Ken Grayson, in the August, 1959 *CQ*, conversion of the AN/ARR-2 requires the addition of a local oscillator 200 kc above or below the incoming signal. The feed-in may be attached to the test jack on the front of the receiver, or the third t.r.f. stage may be converted into an oscillator which may then be tuned along with the r.f. amplifier stages in the slug-tuned front end.

This is possible, and the sensitivity could be described as possibly fair for use in the 220 mc band, after some adjustment of the tuning coils with a grid dipper. I have never run any actual measurements, but you can hear signals in the 200-400 mc military aircraft band on a converted AN/ARR-2.

However, despite its low present cost, the AN/ARR-2 is not an ideal way to get on 220 mc. Consider that the 200 kc i.f. is only .01 percent of the incoming signal at 220 mc. Even a little drift of the transmitter or the receiver would quickly put the signal outside of the 4 kc passband. Tuning would be difficult. Images would be fierce.

A more practical way to use the AN/ARR-2 might be to re-wind the r.f. coils for 2, 6 or even 10 meters. Convert the third stage of t.r.f. to an oscillator, and make a superhet of it. You might even make a double-conversion receiver, beating the incoming r.f. to 1,000 kc, then use the oscillator in the set to convert down to 200 kc for the i.f.'s. You would operate the first detector as a mixer in that case.

This might work—I haven't tried it—you might run up against a lot of birdies, depending upon your selection of frequencies. For 2 meters, or 220 mc, you would do better to use a first i.f. in the vicinity of 15 or 20 mc for best image rejection, then go to 200 kc for selectivity.

Incidentally, the AN/ARR-2 makes a fair broadcast monitor. Hook an antenna to the lead coming off the plate (pin 5) of the first detector,

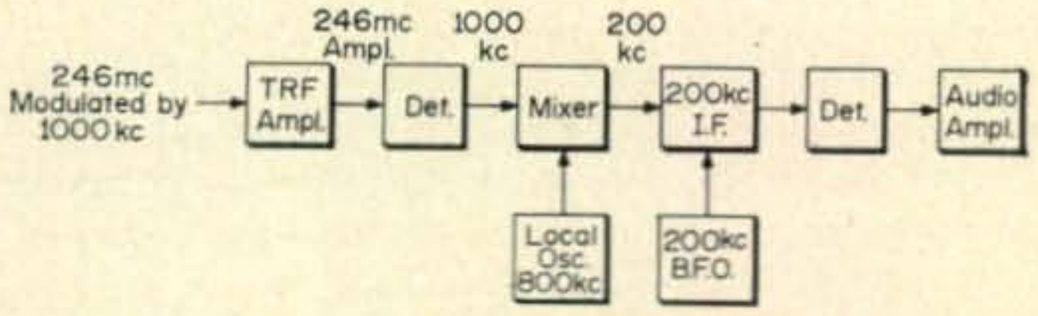


Fig. 1—The block diagram of a AN/ARR-2.

*5716 North King's Highway, Alexandria, Virginia 22303

V_{104}. You can set up the six channels for local stations in the 540-1030 kc band. This actually works pretty well. You can discard the first four tubes, as the v.h.f. portion is not used, and, if you have a 12 volt version, (R-3A/ARR-2X) you can also throw away the b.f.o. and its control tubes, V_{109} and V_{110}.

You don't get a million dollars worth of broadcast set, but it is as good as most five-tube receivers, and has a more selective i.f. than most, plus the b.f.o. if you want it. You can get more coverage by adjusting the selecting channels.

The hookup to the dynamotor plug in the AN/ARR-2 is identical to the command receivers. In the rear jack only ground and filament leads are connected. R.f. gain is at pin 2 of the front plug (J_{104}); pin 3 is tone control for the b.f.o.; pin 5 is audio; pin 6 is filaments; pin 4 is ground; pin 7 is the b.f.o. ON-OFF.

There are two versions of the AN/ARR-2, the "X" indicating 12 volt filaments, the R-3, R-4 differences are inconsequential.

In addition to the AN/ARR-2 receiver, the set includes a test oscillator, TS-24/ARR-2, which contains a gold-plated cavity that might make the basis of a fine portable 220 mc rig. These were recently available from G & G Radio, 75 Leonard Street, New York, at about $10.

The tech manual for the AN/ARR-2 is AN 16-30-ARR2-2. It is available from Propagations Products Co., Box 242, Jacksonville, Florida, or Sam Consalvo, 4905 Roanne Drive, Oxon Hill, Maryland.

Surplus In General

The AN/ARR-2 is one of the old-line surplus items. It has been around since the end of WW II, and since the Navy dropped the YA/ZB navigation system in the 1950's it has been out in sizeable quantities. Surplus has changed since the AN/ARR-2 and the AN/ARC-5 sets were dropped on the civilian market. The thousands of aircraft and hundreds of naval vessels of the 1940's have been replaced by a few hundred planes, a fraction the number of ships, and those complicated missiles. Electronic gear has gotten more complex as it has shrunk in numbers.

Since the Korean War, surplus material has become a more selective commodity. The Pentagon, looking to save the tax dollar if it can, now sells its surplus in ways designed to bring more return than it once did. Test equipment and other potentially valuable gear is sold selectively for much more nearly its original cost than was the case years ago. The massive volume of less desirable material is handled as "electronic junk," and it is often left out in the rain for weeks, handled like trash, and generally mistreated.

The larger surplus dealers, which survived the decline of the last eight years, generally deal now in better quality gear. Often it is checked out by competent technicians, and obviously it costs more. This is the natural result of the really good material being released—test gear that was retained after WW II, and communications gear which was not outmoded in 1945.

Many of the small dealers of ten years ago are out of surplus, replaced to a degree by junkmen and scrap dealers who handle electronic junk, old cars, and metal trash.

Since the scrap yards are not interested in electronics, surplus has indeed changed. No longer are there scores of dealers selling command sets and SCR-522's around the country. Radio Row in downtown New York will be killed off by demolition for the World Trade Center.

The decline in military surplus has been matched to a degree by an increase in industrial surplus—obsolete computers are currently a big item—Industrial surplus usually consists of components rather than complete items, at least not complete units of interest to the amateur or the experimenter at home.

One example of relatively high-cost surplus is the Servo R-5200, an Air Force receiver covering 20 to 200 mc. Built by the Servo Corporation of New York, it is a lab-type unit, operated off 115 volt 60 cycle power. The set will receive a.m. or f.m. signals, c.w. or f.s.k. It has special adapter circuits for attachments including telemetry, panoramic, direction finding, and other specialized equipment, including the AN/TRD-10 direction finder.

The R-5200 is designed for 19 inch rack mounting. It weighs 60 pounds and features continuous tuning with frequency verniers, an S-meter, and a built in speaker.

Sensitivity is not really up to current amateur equipment, but this is one of the very few tuneable sets which cover the six and two meter bands among surplus items. ■

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MARK Products Division of Dynascan Corporation announces the introduction of their KW line of high power Heliwhip mobile antennas for amateur use.

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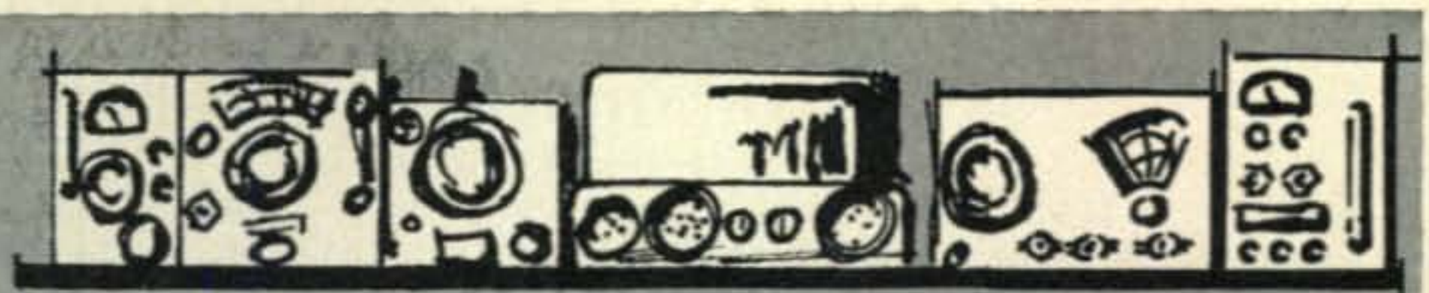

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RTTY [*from page 92*]
his CV-116/URR converter. *(Try Propagation Products Co., Box 242, Jacksonville, Florida.)* W8BBB of South Euclid, Ohio (Cleveland area), reports operation about to start on 146.70 and 52.60 f.m. with a.f.s.k. (They now use 146.94 and 52.525 f.m. for 'phone.) W8QNF of Jackson, Michigan, is building the W2JAV transistorized selector magnet driver. (*CQ*, Nov. '62, Dec. '64 RTTY Column.)

VE7UC/Ø in Colorado Springs, Colorado, has an FRR-24 but no manual. *(Try Propagation Products.)* KØDOM of Lincoln, Neb., uses narrow shift on 20. WØJTN of Wichita, Kansas, has a new Swan 350 and kw linear but uses an old home-brew kw on RTTY. WØITU is in France, awaiting reciprocal licensing.

I1CQD of Florence, Italy, is on 20 with tape. I1ORS, also of Florence, has a TH-35/FG and is looking for a manual. HL9KG/KH6FIG is trying to get on with a CV-89/URA-8A but is missing a few minor parts. ON4UN of Bollelare, Belgium, has a Model 28ASR but needs series governed motors. He will swap 60-cycle synchronous motors and will pay the freight.

Narrow shift signals heard at W2JTP on Sunday mornings around 7140 kc: W1BGW, W2JAV/2, W8ZM, K9LBA, VE2HL, VE3CM, VE3WR, VE3DTY.

Comments

If you like (or don't like) our "RTTY Clinic" format this month you might drop us a card with your comments. Of course, we don't have quite the space available that Chuck has, but we will try to answer as many questions as possible without being too brief. A suggestion: Send along a picture (glossy print) of *your* RTTY ham shack and we will try to include it with the answer to your question.

73, Byron, W2JTP

FMTRU on Two [*from page 36*]

An even greater improvement, in the order of 5 db, is possible with a stacked co-linear antenna of 5 half-waves in phase.[8] Such an antenna is fed with 300 ohm twin lead to cut down transmission line losses, particularly if a long run must be made. Highly recommended is the Amphenol #214-103 "Marine Core" twin lead. This is the most electrically stable (meaning that wet weather has little effect) of any twin lead that we have ever used and will handle about 500 watts of power, according to the manufacturer, *and*, has a loss of only 1.85 db per 100 feet at 145 mc! ■

[8]Kretzman, B., "Five Half Waves in Phase on 144 Mc," *CQ*, March 1964, p. 80.

Totatype II [*from page 67*]
one man job. The mast was bolted into place on the platform, the guy lines were fed through the eye bolts in the ends of the outrigger arms and tied down to the under-frame of the car and the feed line connected to the T-R relay inside the van.

Such an installation has been tried on several outings and found to withstand winds in excess of fifty miles per hour. It has one outstanding advantage as far as an antenna goes. You don't have to look around for a spot on which to erect your antenna, you brought it with you.

Suggestions On Portable Power

The power requirements will vary greatly with the gear used and other needs such as light and heat when you go portable. If you are on a Field Day with others, the power will undoubtedly come from a large central generator. Working individually and away from power lines, you will need something small enough to haul along in the trailer-van or car. The new gasoline engine driven alternators are ideal for the purpose. They are relatively light in weight, use very little fuel and create practically no interference with radio operations. You can even operate these gadgets from inside the station wagon in bad weather by piping the exhaust to the outside.

We have been using a trailer-van for portable operations for a number of years. Some precautions should be taken if your equipment is to travel without damage. The tables, racks and even the heavy teletype printer, which is normally not fastened down to the table, should be tied down securely with rope, belts or wire. The vans are usually fitted with eye bolts in the floor and rails around the sides for this purpose. All loose gear such as the transmitter, receiver, *etc.*, should be stowed on quilted pads on the floor. These pads reduce road shocks and keep the equipment from sliding around. We have carried extra wire, tools and miscellaneous items in an old camp box which also doubles as an extra seat. The main throne which we take along for his exalted highness, the chief operator, is an old wooden swivel-type office chair with arms and a comfortable seat pad.

It sounds like a lot of trouble to get a portable teletype station in the field but taking a machine along will be worth the effort in the added pleasure it will afford, the added points it will pick up on Field Day and the tremendous value it will be in the handling of message traffic during a real emergency. Tote-a-teletype the next time you go. ■

G2DAF Linear [*from page 27*]
there is room for experiments to determine what values are best suited for individual voice characteristics.

Plate Circuit—Insofar as the plate circuit is concerned, it is conventional. A standard pi-network circuit is used with readily available plate tuning and antenna loading capacitors. Tuning is the same as conventional linear amplifiers.

Conclusion

Although the input to this amplifier is 300 ohms, no trouble has been experienced in loading the HT-32A or the NCX-3 which have been used to drive the linear. A more exacting match can be made, should the individual desire to build a matching unit.

An initial check to find out if the voltage doubler is operational is as follows: with the final tubes out of the sockets and the filaments of the doubler on, the exciter is loaded into the linear. With a d.c. v.t.v.m. the voltage on the screen grid terminals should be approximately 400 volts. If this reading is obtained, s.s.b. voice excitation can be applied and the v.t.v.m. reading should vary from zero to 800 volts peak at a syllabic rate. Here then is an amplifier of somewhat unconventional design which, with a little more experimentation, could very well set a design standard for the cost conscious and efficiency minded amateur. ■

RTTY Tape Take-up [*from page 29*]

Slip a reel of tape in the box and guide the end of the tape through the slot. Hold the box lid closed with a sheet metal U-shaped clip, or, simpler yet, a rubber band. I prefer to set the box on the floor, with the tape feeding upward to the tape distributor. Simple as it is, this device has never caused the least bit of trouble in tape handling in more than five years of operation.

The same size cigar box is a handy means of tape storage. I put from two to three pairs of tapes (any tape worth having is worth having a duplicate as well as a master) in each box, with a label indicating the content by serial number. The master reference list is printed from a tape.

Use of either or both of the systems will keep the tape off the floor, bench, table, rafters, hooks, and sundry other places where it can normally be found around a RTTY shack. ■

HW Power Supply [*from page 48*]

Construction

The chassis is a standard 5" × 10" × 3" aluminum job. I wanted a compact package so I included the speaker and a phone jack in chassis cover. I acquired my cover from a sheet metal shop. It is made of "decorative" steel, soldered in seams, and finished with wrinkle spray paint. Most hardware stores carry supplies of a variety of this type of sheet stock. The pattern I chose matched the HW-12.

The components used are easily obtainable. The diodes cost me a sum total of $3.09 from Lafayette. It was one of the 89¢ per package type deals; they have a 400 volt p.i.v. rating. The rules would tell you to use more series diodes, but mine hasn't quit yet due to the transient suppression, probably.

The chokes are both from used TV sets also. I highly recommend buying new electrolytics—they often are the reason for junking the TV set in the first place. I mounted my diodes on a surplus terminal board but terminal strips could be used very nicely. For the filament supply I used the 5 volt and the 6.3 volt windings wired in series, not quite 12.6 volts, but adequate. Be sure that the windings are correctly phased so as to add, otherwise you will wind up about 1.3 volts.

The series resistor, 1K 50 watts, brings the low B+ down to the recommended 250 volts. The wattage is figured for continuous use; so

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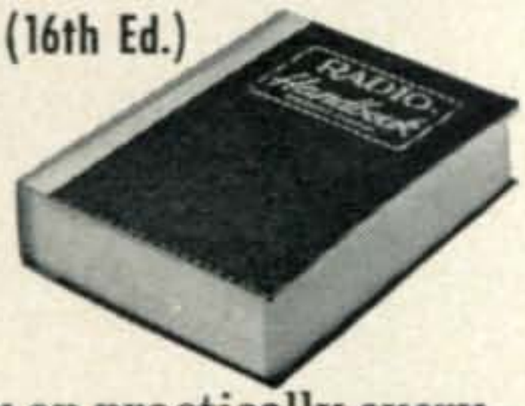

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829B on Two [*from page 59*]

We have enlarged the small tank from three to eight turns, eliminated or at least reduced parasitics and have a nice gap in the center of both the input and output tanks to insert the coupling link.

The circuit and mechanical arrangement are shown in fig. 1. The bias is supplied from a fixed source if linear operation is intended or the circuit can be returned to ground through a resistor for grid leak bias (Class C operation). ■

Ham Clinic [*from page 77*]

find an article by W2GHK. This will give you the information on the use of a lattice crystal filter which is merely inserted between the antenna and receiver. The filter passes little or no signals out of its pass-band (about 30 kc). With 6 stations on the air at 4U1ITU and using the filters, operators had no trouble working on all bands simultaneously during the 100th Anniversary Celebration of the International Telecommunication Union. I was there and worked with a couple of the IARC stations. I can say that *without* the filters it was impossible to work on 20 meters with a 40 meter station going, or another station on 20 meters on c.w.

Thirty

I would like to make a suggestion to the readers of HAM CLINIC. I know that most of you write in and require personal answers, but I also know that there are many of you who have some good questions that would be very suitable for publication, the answers to which you do not require or want personal replies.

Now then, if you'll merely address a postcard to me with your question on it and state "no personal reply required," I'll know the question is for publication. Be brief and to the point and include your call and/or name.

For this month then, all the best to you and yours. 73, Chuck, W6QLV

USA-CA [*from page 80*]

The Finnmaid Award is issued by the Finnish women radio amateurs under the control of the Finnish Amateur Radio League, SRAL. The Finnmaid Award is available to any licensed amateur as well as to any short wave listener all over the world. The requirements are: Scandinavian amateurs (LA, OZ, SM, OH) need contacts with at least 7 OH-YL stations. Other European stations need 5 contacts. Non-European amateurs need 3 contacts. S.w.l.s anywhere in the world need 10 confirmations of their reports to OH-YL stations. The contacts must have been made with stations owned *and operated* by duly licensed Finnish woman amateur operators. The starting date is July 10, 1947. Any bands

and any mode count, no endorsements are available. The QSL cards and return postage of 4 IRCs must be sent along with the application in the case of European applicants. Non-European applicants will submit only a list of the contacts required giving the ordinary information (including names of the YLs) plus 4 IRCs for mailing costs. Address for the application: Finnmaid Custodian, P. O. Box 306, Helsinki, Finland.

"FINNMAIDS": OH1 NF, OK, QV, RB, XH, XU, YL, ZD, ZG; OH2 exBAF (now 8RM), BB, BBT, BBW, exBCT (now 3YL), BEA, BED, BEK, BFG, CM, FB, FM, exGX (now 8YL), MP (ex4ND), TJ (ex5SL), TO, YL, ZM, ZN; OH3 ND, YL (ex2BCT), ZZ; OH4 exND (now 2MP); OH5 RZ, exSL (now 2TJ), SM, TT, YL; OH6 VD, YL; OH8 RM (ex2BAF), YL; OH9 YL; OHØ ND (ex2QJ). The following calls have been deleted, and may have been given to OM operators later. If you have any of these QSLs, check the names in order to be sure that the operator was YL. OH1XM/Birgitta, OH2BAG/Hilda, OH2IA/Ebba, OH2NC/Maija, OH2-OW/Marjatta, OH2QJ/Lis (now OHØND), OH2QW/Raili, OH2US/Margareta, OH2VJ/Hilja, OH3NN/Sinikka and OH5RK/Aino-Maija.

WHC, The Guayaquil Radio Club, member of the I.A.R.U. since 1950 sponsors the certificate WHC (worked HC) which it grants to the radio amateur who verifies contacts with a minimum of five (5) HC districts from HC1 to HC8. There is also a de-luxe WHC certificate for those who have worked all eight districts. The certificate has been designed with the Ecuadorean Coast motif and drawn with vignettes of the Island of Puna in the era of the famous Incas, and reveals a vigorous expression of folklore art existing in the Guayas Province. Your application and QSL cards should be mailed to the Guayaquil Radio Club, P. O. Box 5757, Guayaquil, Ecuador. Or you may send a certification by your local Radio Club testifying that you have worked and have QSLs from the required number of HC districts.

Worked All Nova Scotia Counties, The WANSC Award is offered by the Nova Scotia Amateur Radio Association to any radio amateur who meets the following requirements:

1. The WANSC certificate is awarded to:

(A) Any amateur *outside* of Nova Scotia, New Brunswick, and Prince Edward Island who submits proof of having established phone or c.w. contacts on any amateur bands with one (1) amateur operating a regular "home" station and/or "portable" station in each of any 15 counties of Nova Scotia. Sable Island may be substituted for one county.

(B) Any amateur *in* Nova Scotia, New Brunswick, and Prince Edward Island who submits proof of contacts located in each of any 15 counties of Nova Scotia; or 14 counties plus Sable Island. In addition, any 10 counties on any band other than the band of those submitted in the first 15, must be worked and proof submitted.

2. All contacts must have been established while operating a "fixed" or "portable" station. Contacts between stations operating "mobile" may not be used.
3. The amateur seeking the award must have established all his contacts while operating from the "home" station, or within an area having a radius of no more than 10 miles from the regular "home" station. He may, however, use contacts with other stations operating "portable" anywhere in a county.
4. Contacts must have been made after June 1, 1960.
5. Applications, accompanied by 15 or 25 QSLs, as the case may be, together with 15 cents return postage, must be submitted to the Nova Scotia Amateur Radio Association, P. O. Box 663, Halifax, Nova Scotia, Canada.

County Hunter Nets

COUNTY HUNTER NETS

As any county hunter will tell you, the quickest way to add counties is to check into the nets and the two popular nets are daily on 7223 kc and nightly on 3947 kc, good hunting.

Again many thanks for all your wonderful letters and help, the most unusual Christmas card came from Jack, W4NOK and Frances, WA4NFA. I've run out of space, but I'll be around again next month and I know I'll be hearing from you. How was your month?

73, Ed, W2GT.

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For further information, check number 41, on page 110

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Quiet Weekend [*from page 62*]

knob-twiddle until just watching them becomes an obsession for the observer. Young schoolboy, just entering this marvellous new world, sophisticated s.s.b. DX-er, die-hard c.w. man, v.h.f. specialist—they twiddle knobs. If there is a knob that wiggles and a dial to prove it wiggles, they're in business. I once watched a man go slowly around the booths within my vision. On one booth alone there were nine pieces of gear, each with several knobs. He examined each article, twiddled each knob, then gravely went on to the next booth. The only comparison is the woman buying dress piece-goods, who can choose only by touch, rarely by sight.

Well-known guests, like Gus Browning last year and Runday this year, are surrounded by crowds of admirers, like short-wave Beattles. The noise is almost palpable. The occasional announcement drones over the P.A. Somebody is wanted urgently. A gold pencil has been found. Will the owner of car number so-and-so please remove it at once from outside the police barracks round the corner (that moved him!) The only circuit diagram in existence of the HRO-500 had been taken by a schoolboy pamphlet collector from one of the booths. Would he *please* return it? In the king-size bar the barmen work at full tilt, for all that talk produces prodigious thirsts. They can supply five kinds of scotch, eight kinds of beer and no ice. Warm beer makes the hair curly and prevents scurvy.

The only difference between men and boys is the price they pay for their toys. Thousands of pounds change hands during these four days. British manufacturers are now producing a fine range of superb equipment, yet, still, European amateurs covet American gear and are willing to pay the heavy excise and freight charges which escalate the basic price. The controversy about home-brew versus commercial rages, for the Briton is above all conservative, anti-Big-Business and a fierce individualist. Many still quote the ancient pontification that the radio amateur who buys anything at all is not entitled to call himself a radio amateur!

One thing is significant and sad. More and more of those Old-timers, who started amateur radio in the earliest days, as young boys, are now ageing men, their ranks rapidly thinning each year. And each year they have to search more carefully, a little bewildered and a little desperately, for the old, familiar faces. Then they greet each other with as much relief as pleasure and play at "waggons-in-a-circle" in defense at the hordes of newcomers, the clear-eyed, brash, hopeful youngsters, to whom a spark-gap sounds like science fiction.

A tradition of the Exhibition is the big-value raffle prize which is donated by one of the largest exhibitors. *Every* year since the inception of the Exhibition this prize, worth at least four hundred dollars, has been won without fail by a short-wave listener.

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VHF [*from page 86*]

Six & Two Notes

Activity on these bands is on the rise all over; we only wish space permitted an extensive break-down. F.m., as noted in the 432 report above, is on the upswing, but most noticeably on two meters. Wide band is used primarily in outlying areas, although N.Y.C. interest is growing rapidly through the use of repeaters. Operators with w.b.f.m. in the east check in on 146.94 mc and are relayed (through kind services of K2IEZ) to remote points, K2ZSQ's OM, Red, K2ZSP, recently installed a converted Link set for mobile operation on two (50 watts out) and in the first week's mobiling had a 59 QSO with W3CKP in Doylestown, Pa. He notes that this is *typical* for this mode.

Openings galore surprised many six and two men through the winter months. Many suspect that the usually mild weather (no snow from N.Y.C. through Indianapolis as of 1-17-66) had a lot to do with this. On two, temperature inversions have been more frequent than expected; on six, Sporadic-E of intense proportions has permitted many double-hop W1-W6 QSO's not generally possible before May.

With more and more six meter openings installing a monitor TV receiver on Channel 2 in the shack to catch openings, the feeling now is how much longer can this continue? Time will tell . . .

Bob Davis, KØFPC, writes; "Would like to see some public recognition of the guy with the Communicator or Twoer who is a regular but not a DX'er. The only way to get people up from the d.c. bands is to give the RCC boys someone to talk to—They aren't interested in DX or moonbounce or Oscar—Just good conversation."

Something for Everyone

Thanks to WA2SAZ and WB2FEQ, a copy of the 18-page *National Award Hunters Club Newsletter* reached our desk not long ago, chock full of interesting tidbits. In addition to general club news, the *Newsletter* has a free classified ad section, letters column, award data, membership list, and v.h.f. news. The organization, still quite young, was formed as a meeting place for certificate chasers, but now promises to interest a still wider group of amateurs.

Scanning the roster it looks like many members are dyed-in-the-wool above 50 mc characters, and the club objectives and programming are worth looking into. Contact WB2FEQ, 47 Hicks St., Brooklyn 1, N.Y., for more info.

Thirty

If this month's column looks bleak, it's because this reflects our mail of late. The letters section will return next month (if we get some letters!).

73, Bob, K2ZSQ and Allen, K2UYH

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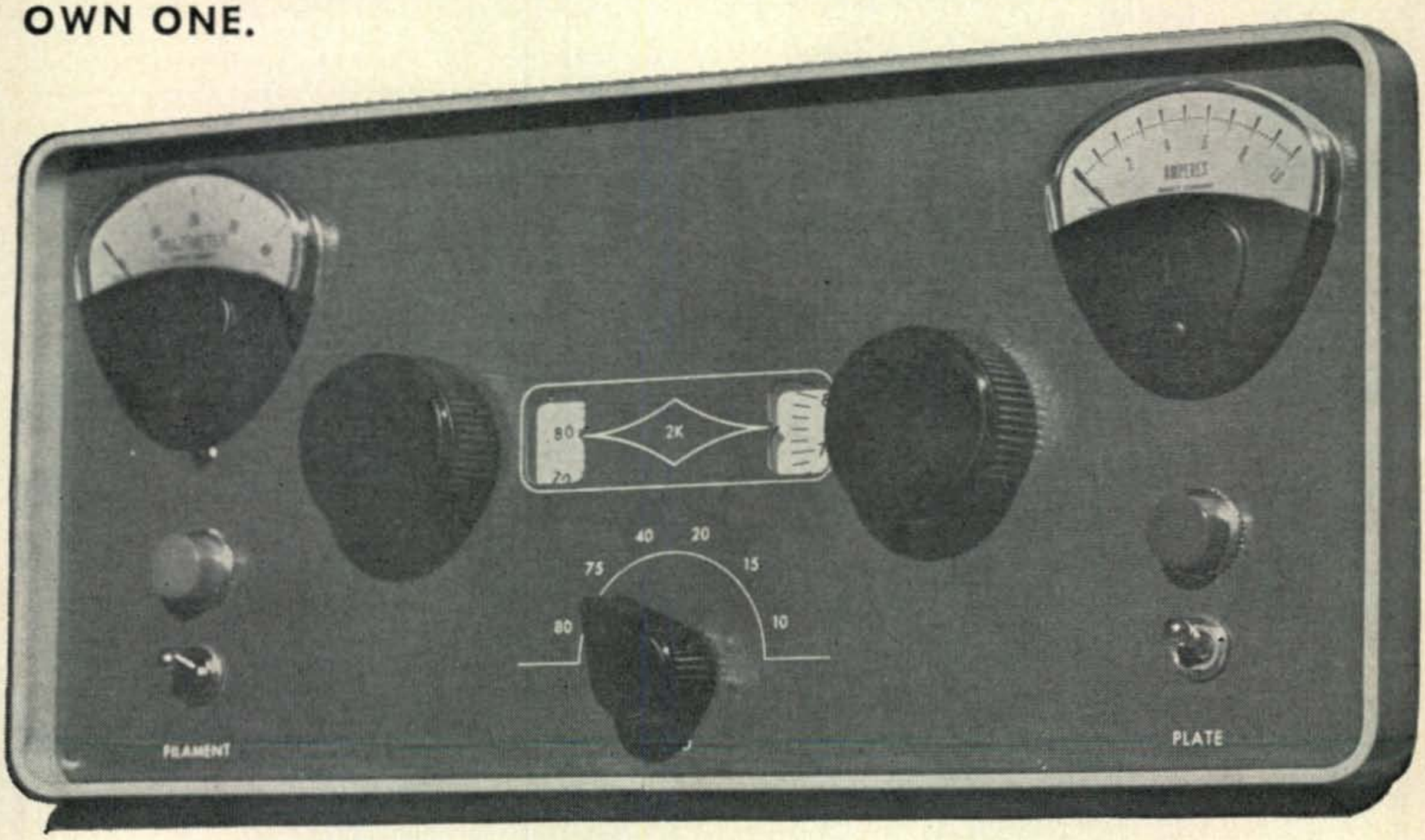

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WANTED—An APR-14, 13 receivers. SG-13, H-p4, SG-1, SG-2, MD-83, 479 Collins, in any condition. T-368-C xmtrs. R-390, 390A. R-388, 389, 391. Receivers. RT-66 thru 70 Rt units RT/77-GRC-9, GRC-10, GRC-19. RCA, Bendix, Collins Aircraft Radio and Radar Equip. Hewlett Packard, General Radio, Tektronix, etc., Test Equipment. GRC, PRC, GRR, TCC, ARC, sets ARM, PRM, URM, UPM, URM, SG Test sets any and all types. You name it. Call E. Charol, Tech Systems Corp., 42 W. 15th Street. N. Y. 11. N. Y. CH 2-1949 Collect.

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PRINTED CIRCUIT BOARDS Hams, Experiments. Many different projects. Catalog 10¢ P/M Electronics, Box 6288 Seattle, Washington 98188.

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WANTED—QSTs for private collection. 1920-Jan., Dec., 1916-Feb., May, June, July. K2EEK, CQ Magazine, 14 Vanderventer Ave., Port Washington, L.I., N.Y., 11050.

FREE FILTERS: Names and addresses of TV manufacturers currently furnishing free high-pass filters for TVI. Complete with application forms, 25¢. Club package (25 lists and forms) $2.00. TVI, 19 Hillview Ave., Port Washington, N.Y.

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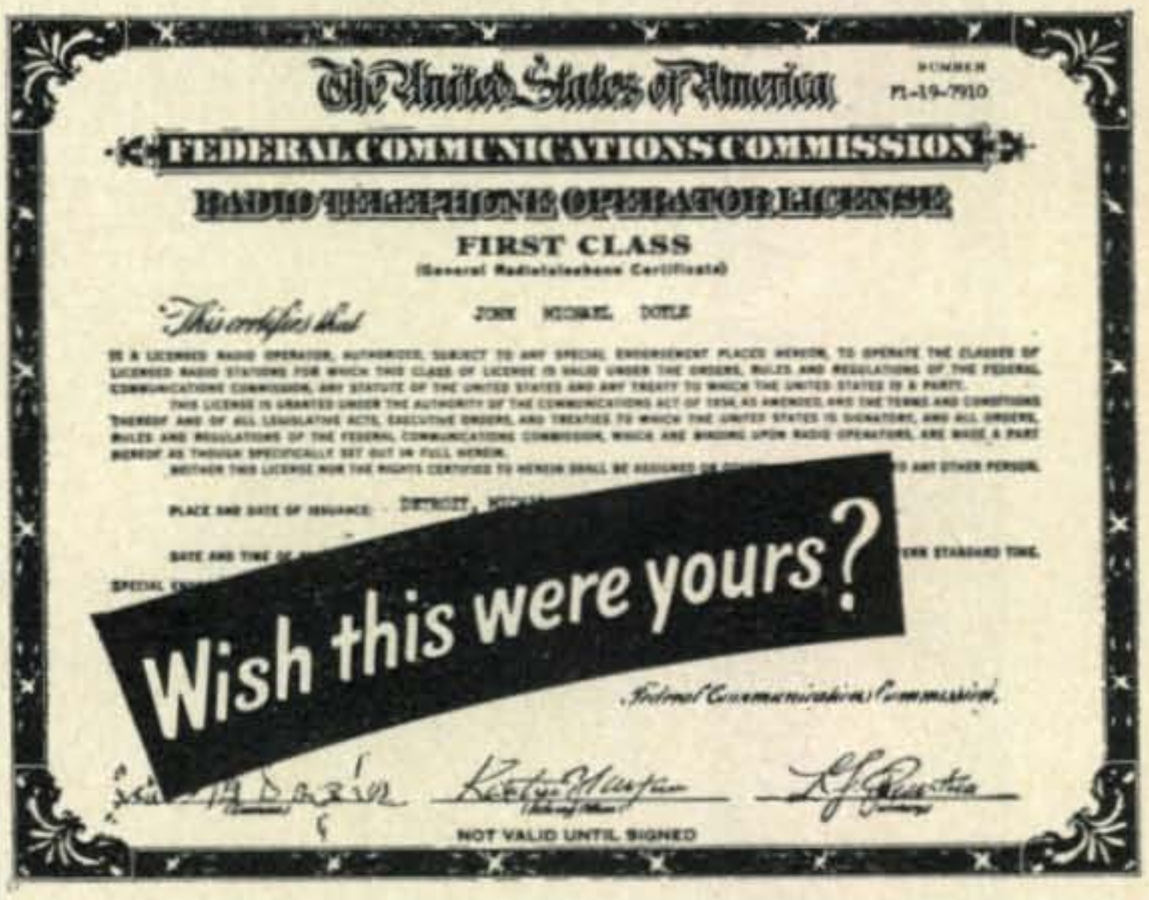

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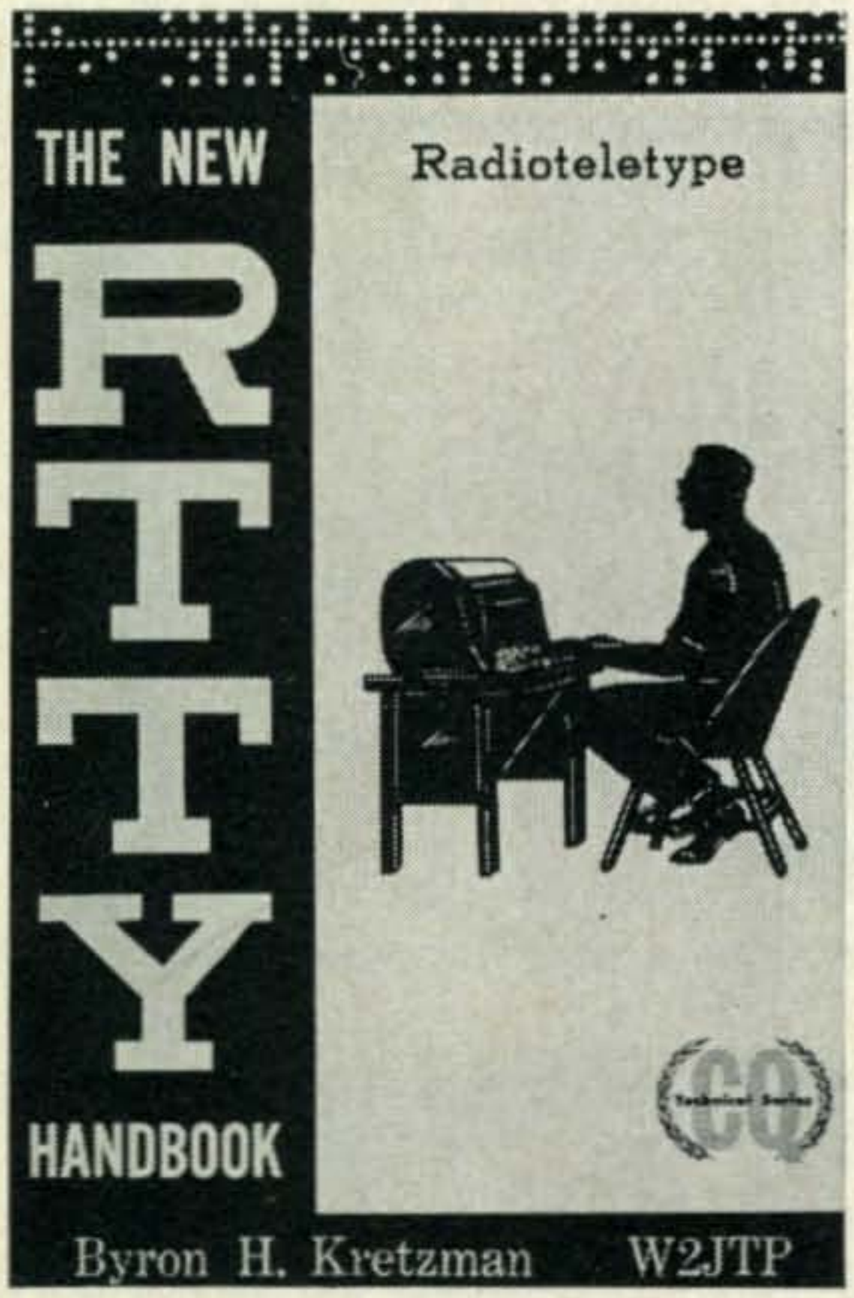
"THE NEW RTTY HANDBOOK"



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WANTED . . . Silver dollars. Any condition, will buy or trade. Drop a line if you have any other coins for sale or trade. Scott Cowan Dept J5, 73-62 Bell Blvd. Bayside 64, N.Y.

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EXPERIMENTERS HAMS Good used electronic pts, hardware tubes cond coils trans sockets, etc. 100 lbs $20. Varable Trans 4000 Watt 120 V $20. Eltz, Juniata, Nebr.

FOR SALE: Telrex 20 mtr 3 el. O.S. Super-Deluxe Beam. 26' Boom—$100. Gary Stilwell W6NJU 8114 Irondale, Canoga Park, California 341-9899.

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CERTIFICATE will be issued by Henry Ford Museum to any station that works the Motor City Radio Club station, W8MRM, during the 24 hours prior to the Old Timers Night banquet. Work W8MRM on May 7 (GMT) on or near 1.815, 3.663 (even hours), 3.900, 7.070 (odd hours), 7.215, 14.300, 50.178 or 146.94 Mc. Novice contacts by schedule. QSL for certificate.

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INTERESTED GOOD USED equipment cash grid dip meter, watt meter, SSB mike, Heath HO-13, antenna scope, linear. Write A. H. Davis, Box 831, Borger, Texas.

FOR SALE—Lafayette RK-127A Tape Recorder. Brand New, $75. K1EPN, Box C-100 Boston College, Chestnut Hill, Massachusetts.

SWAN—350 for sale with 117-XC power supply and speaker. Guaranteed like new $435.00 cash. Rus Sackers, W8DED, Box 218, Holland, Mich.

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OR RELAY

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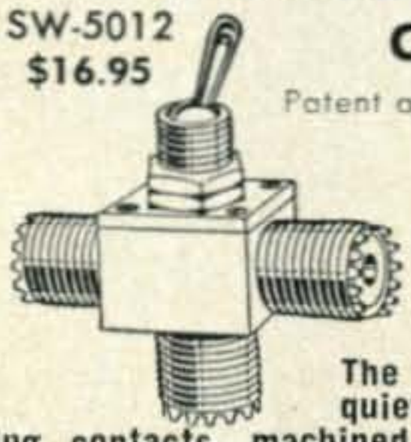

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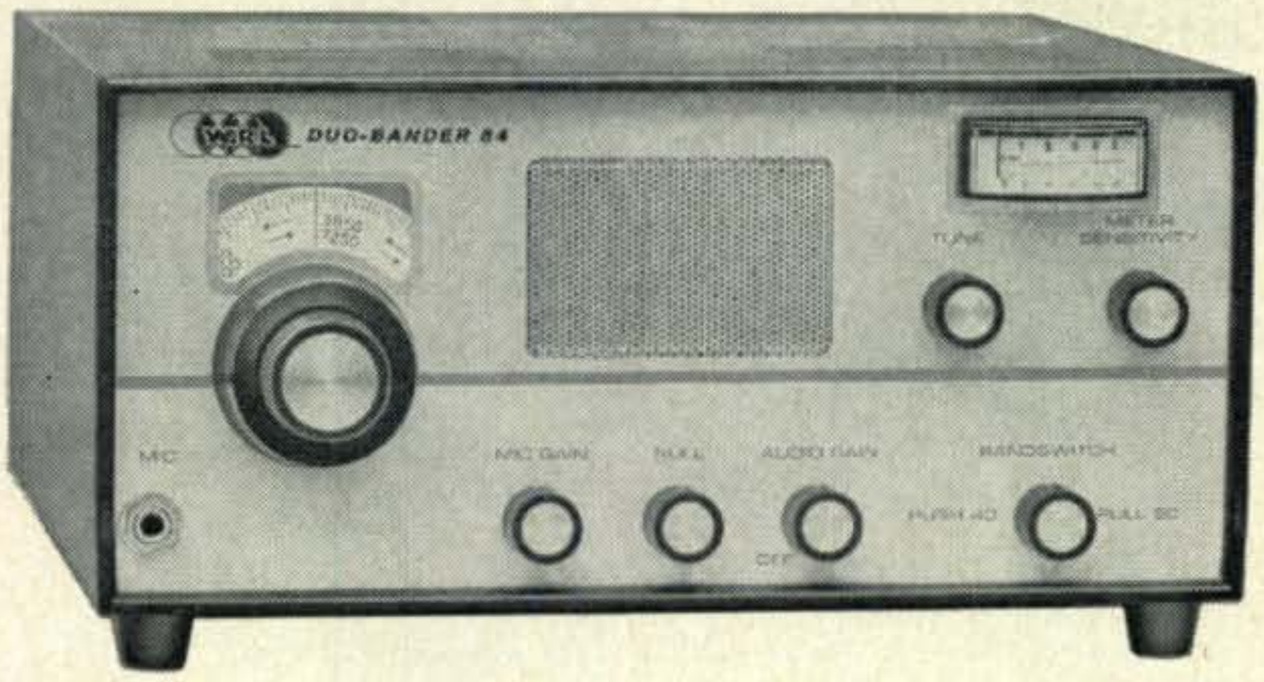

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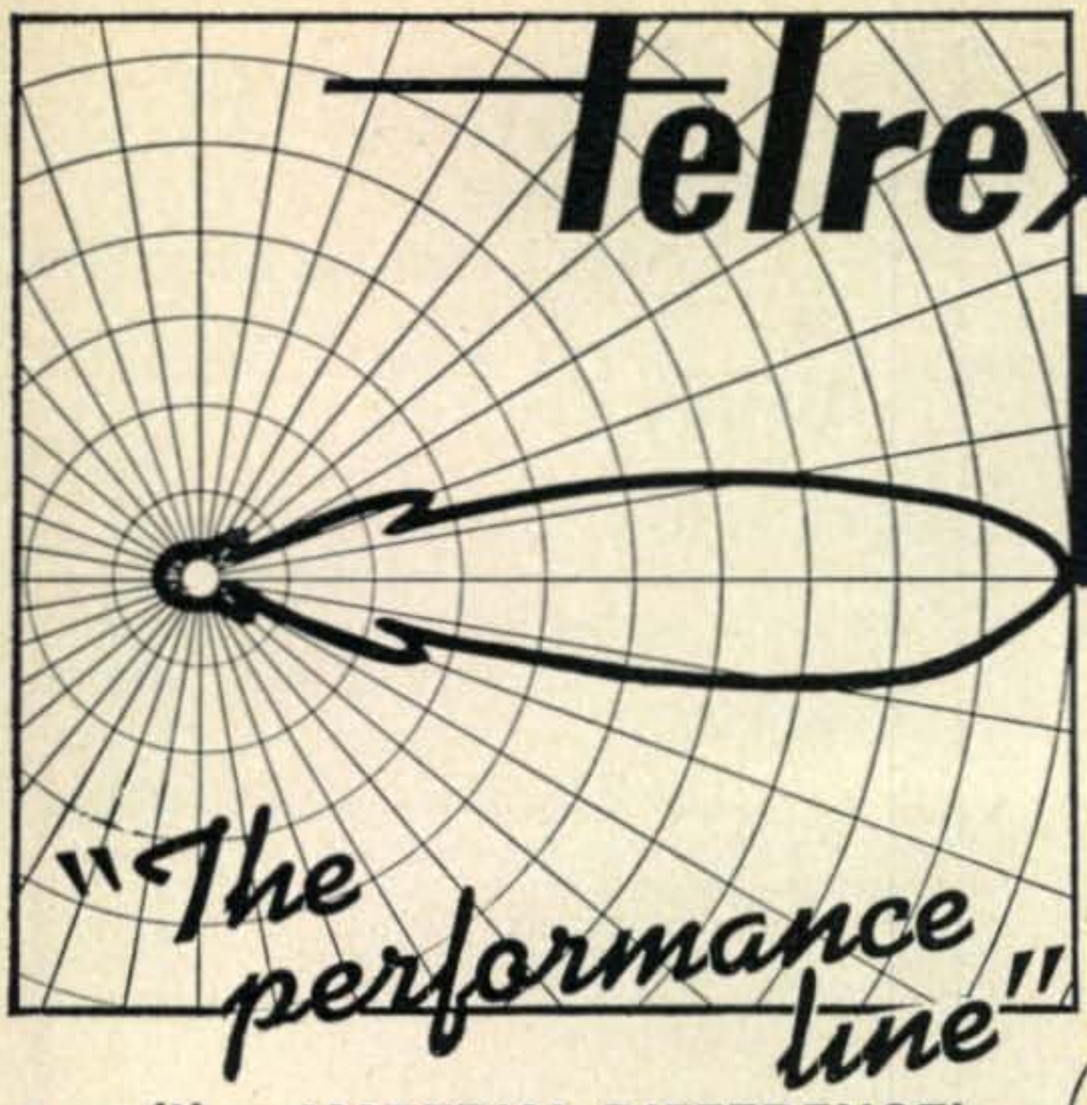

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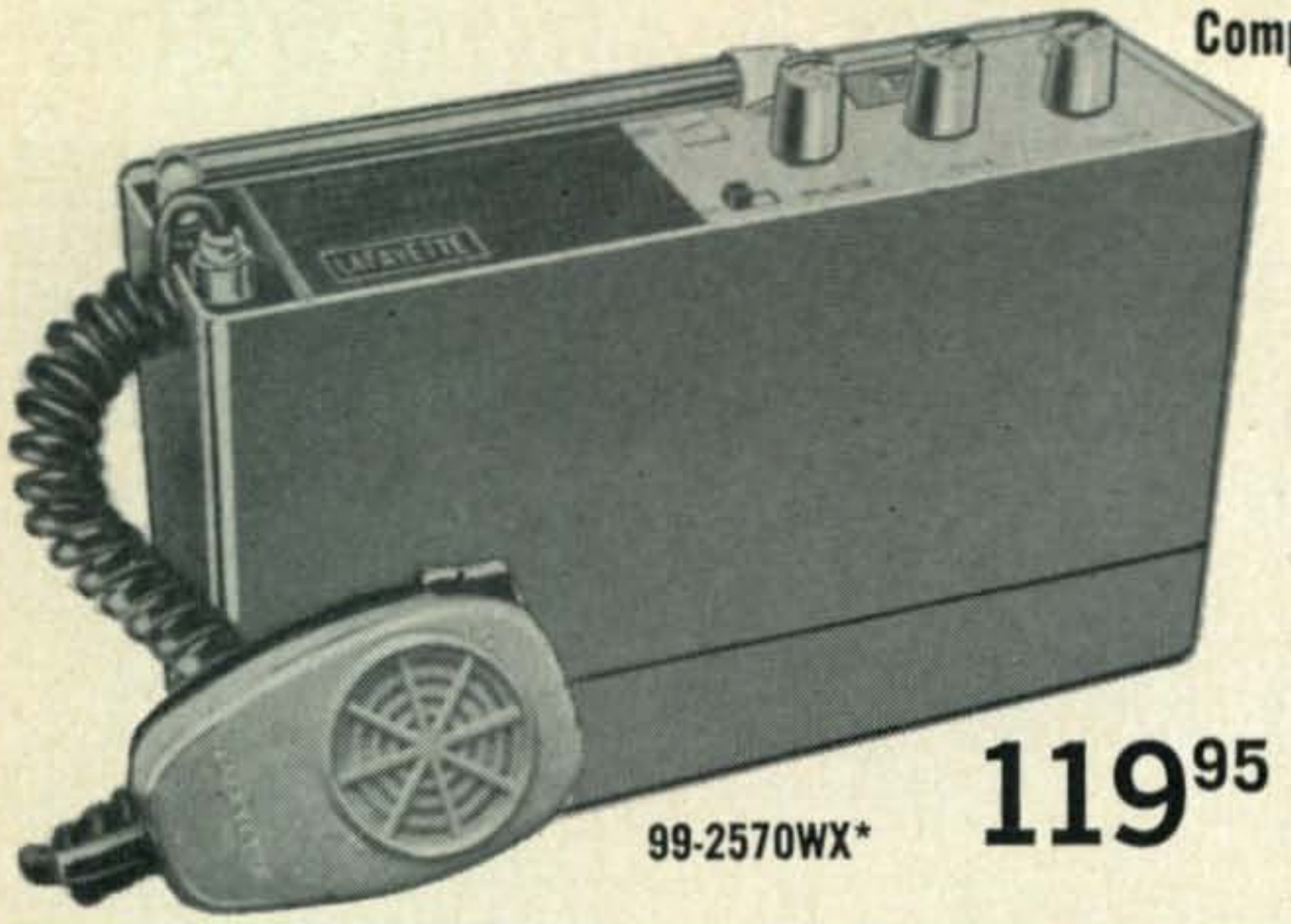

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A great new 6-meter transceiver designed for portable, mobile and fixed station use (with optional AC supply). All solid-state circuitry delivers more than 50% RF to the antenna. Has phenomenal 1.2 μV sensitivity; noise limiter. Includes push-to-talk dynamic microphone, leather carrying case with shoulder strap, telescoping whip antenna and batteries.

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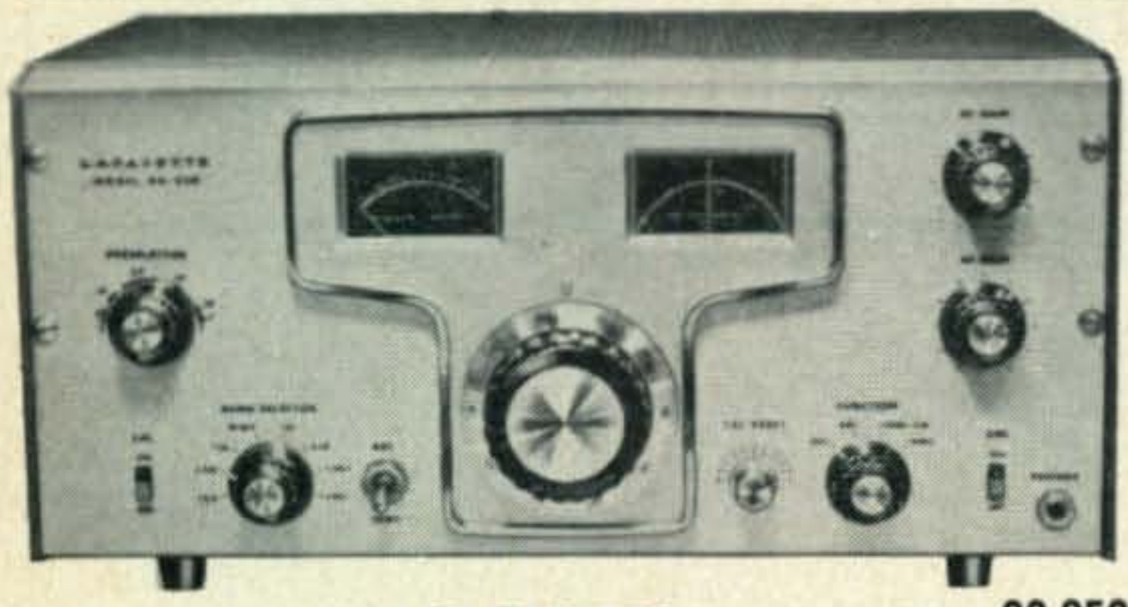

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- Mechanical Filter for Exceptional Selectivity
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- Automatic Noise Limiter
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- Complete with Crystals for 80, 40, 20, 15 and 10 Meters

*Imported

FREE! *Lafayette 512—Pg. 1966 Catalog No. 660. Write:*
Lafayette Radio Electronics Corp., Dept. CC-6, P.O. Box 10, Syosset, L. I., N. Y. 11791

For further information, check number 28, on page 110

In a townhouse on Louisburg Square...

Louisburg Square . . . an island of tradition and elegance on Beacon Hill in Boston. Also, the home of hotel man Ernest Henderson, W1AUC/UDY, and the location of his amateur station. Mr. Henderson is Chairman of the Board of the Sheraton Corporation of America, and his choice of amateur equipment is National, of course.

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National, of course.

NATIONAL RADIO COMPANY, INC., *37 Washington St., Melrose, Mass. 02176*

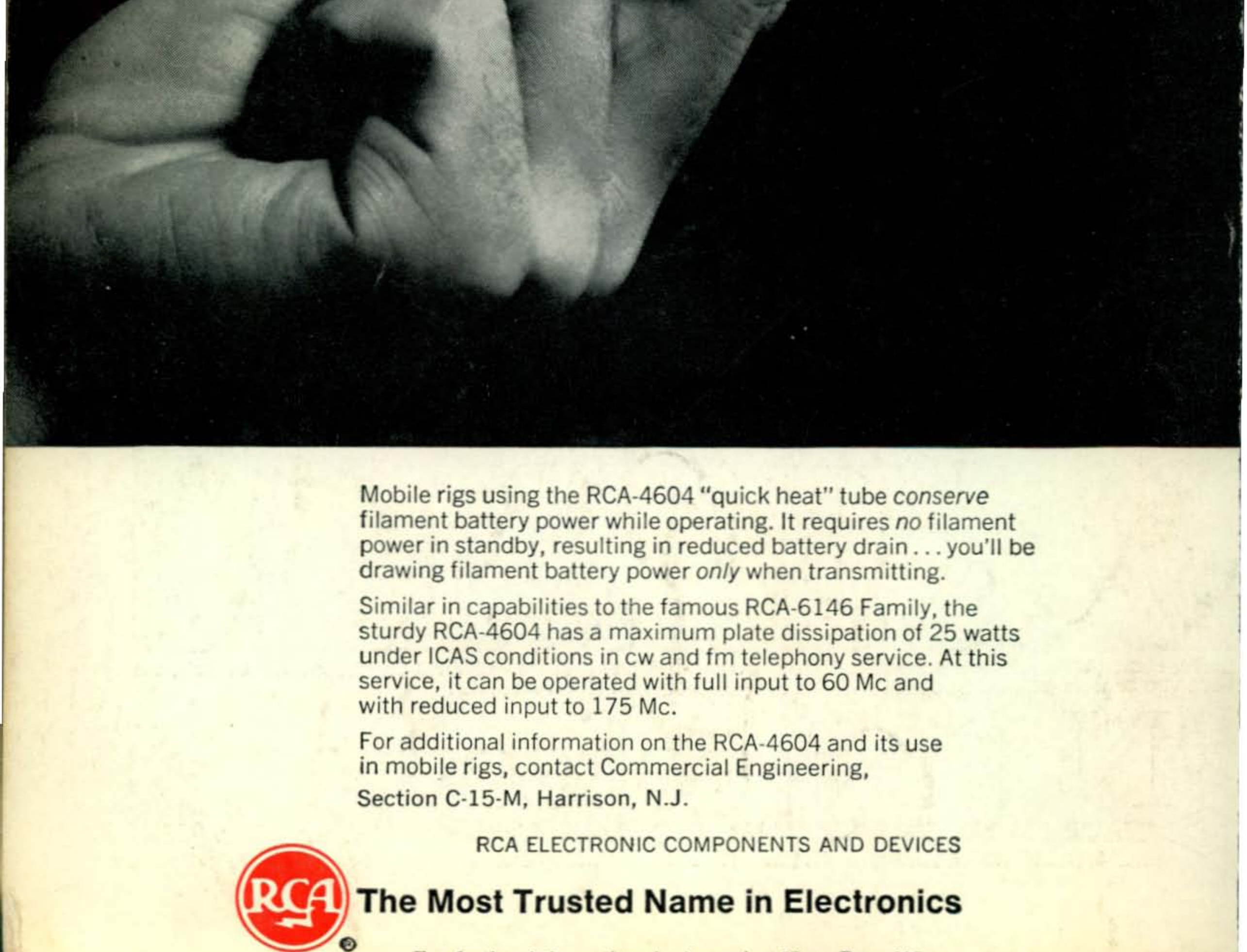
NCX-5, $685.00; NCX-A, $110.00; VX-501, $249.95; NCL-2000, $685.00. Optional oiled walnut cabinets available at extra cost.

For further information check number 51 on page 110

Save
battery power
with the

RCA "quick heat"

Beam Power Tu



Mobile rigs using the RCA-4604 "quick heat" tube *conserve* filament battery power while operating. It requires *no* filament power in standby, resulting in reduced battery drain . . . you'll be drawing filament battery power *only* when transmitting.

Similar in capabilities to the famous RCA-6146 Family, the sturdy RCA-4604 has a maximum plate dissipation of 25 watts under ICAS conditions in cw and fm telephony service. At this service, it can be operated with full input to 60 Mc and with reduced input to 175 Mc.

For additional information on the RCA-4604 and its use in mobile rigs, contact Commercial Engineering,
Section C-15-M, Harrison, N.J.

RCA ELECTRONIC COMPONENTS AND DEVICES

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For further information check number 52 on Page 110